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ARM-H-1

National Program of Research for Forests and Associated Rangelands



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**Proceedings of a National Working Conference
January 17-19, 1978/Washington, D. C.**

Sponsors: United States Department of
Agriculture, Association of State College
and University Forestry Research
Organizations, and National Association
of State Universities and Land-Grant
Colleges

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August 1978





National Program of Research for Forests and Associated Rangelands

U.S. Department of Agriculture in Cooperation with the National Association of State Universities and Land Grant Colleges

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We are pleased to send you this Proceedings. It is an important document for anyone interested in forestry and rangeland research. It reports on a National Working Conference called to identify and assess national research needs for these subject matter areas.

The three-day Conference brought together representatives of a cross-section of governmental, industrial, consumer, environmental, and conservation organizations. Their main task was to list research needs in forestry and rangelands and then place those needs in priorities.

We view this Conference and the events leading up to it over a period of 20 months as a major milestone in the history of forestry and rangeland research. The advice gained through this Conference and the total process will serve as a guide to scientists and research administrators well into the next decade or longer.

We hope that the thought-provoking comments and suggestions contained in this Proceedings will provide the base for a continuing dialogue among the many interested groups and individuals relating to natural resources research.

Sincerely,

ROBERT E. BUCKMAN
Co-chairman
National Steering Committee

DONALD P. DUNCAN
Co-Chairman
National Steering Committee



Introduction

This National Working Conference was one step in a process leading to national and regional programs of research. The Forest and Rangeland Renewable Resources Planning Act of 1974 requires that forestry research planning be a continual process with ample opportunity given for public participation. The Agricultural Research Policy Advisory Committee requested that a national forestry research program be developed as a joint effort between the USDA and the universities.

This National Conference was a follow-up to regional conferences held in Philadelphia, Minneapolis, New Orleans, and San Francisco. The Conference served several purposes:

Foremost, it provided a platform for representatives of a broad cross-section of users of research to express their problems needing research attention. It provided an opportunity to review several special studies which looked into research program policy, organization, and conduct. It also drew attention to the issues and recommendations made by a distinguished panel of scientists, science administrators, and educators convened to discuss policy aspects of forest- and range-related research in the United States. In addition, it provided an opportunity for the Assistant Secretary of Agriculture for Conservation, Research, and Education to express his policies relating to forests and associated rangelands research.

Perhaps the most important feature of the Conference was that it provided a forum whereby scientists, research administrators, resource managers, environmentalists, and consumers representing various public and private organizations could discuss their various needs and concerns.

This *Proceedings* documents one important phase in the Regional-National Planning effort.

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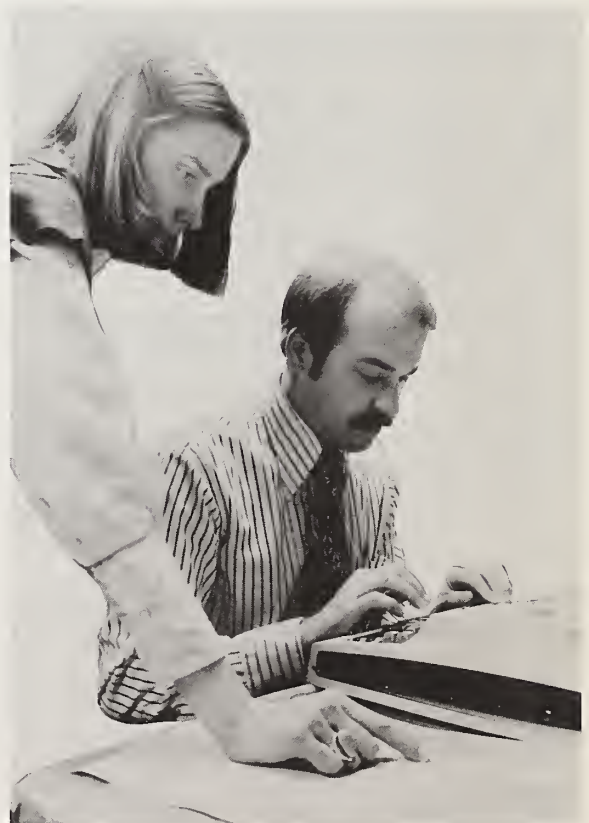
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Conference Steering Committee: George M. Browning, Robert E. Buckman (Co-chairman), John D. Sullivan, and Donald Duncan (Co-Chairman).

Computers and computer specialists made it possible to quickly assemble and analyze the opinions and judgments of participants on the whole wide range of problems considered—and then to present the results to the conference for further analysis.





Banquet speaker Richard A. Pettigrew, Assistant to the President of the United States for Reorganization.



Work groups brought together people with widely differing backgrounds and interests in forests and rangelands. The interaction was intense and productive.



A Mississippi landscape painting was presented to U.S. Senator John Stennis (right) honoring his life-time contributions to furthering forestry and forestry research. Director R. Rodney Foil (left), Mississippi Agricultural and Forestry Experiment Station, made the presentation.



Section I

SETTING THE STAGE

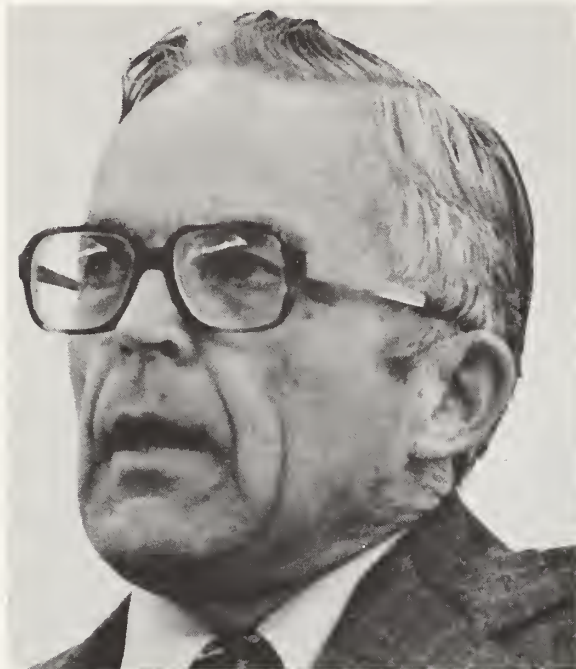


PRESIDING: Dr. John Gray, General Chairman; Research Forester, U.S. Forest Service; Former President, Association of State College and University Forestry Research Organizations; and Director, School of Forest Resources and Conservation, University of Florida

As General Chairman for this National Conference, I want you to know how delighted we are to see all of you here and how much we appreciate your willingness to participate in helping to determine the direction of forestry-related research over the next several years.

The first 2 days of this Conference are going to be devoted to consideration of the *content* of research—the problems, and the importance that should be attached to the problems, on which public research in particular should focus. Beginning with the banquet tomorrow night, we turn our attention to the *conduct* of research—to organization, coordination, productivity, quality, scale. The next two speakers will set the stage for the balance of this Conference.

WELCOME TO THE CONFERENCE



Dr. Donald P. Duncan, Co-chairman, National Steering Committee; President, Association of State Colleges and University Forestry Research Organizations; and Director School of Forestry, Fisheries and Wildlife, University of Missouri, Columbia, Missouri

This conference, in my judgment, is one which will provide an impact of long-term significance. We are about to enter upon the seventh and culminating major event in a series dealing with planning for research on forests and associated rangelands of the United States. In late May and early June last year, the first of these events—a symposium of 18 outstanding scientists, administrators and educators—was convened at Airlie House in Virginia by the Renewable Natural Resources Foundation to critically examine the policy aspects of research in these areas. That symposium resulted in a report entitled *Forest and Rangeland Research Policies in the United States*, containing 19 policy recommendations.

Last July, four planning sessions were held—Minneapolis, Philadelphia, San Francisco, and New Orleans. At these regional meetings, problems in need of research were placed in an appropriate priority sequence as seen from the perspective of the user. Since that time, these problems have been reworked to avoid duplication, to eliminate those not subject to research analysis, and to provide some scientific input to the process.

In October a national conference on forest products utilization research was held in Madison, Wisconsin. It was attended by wood scientists, forestry administrators, and extension, State and private, national forest, union,

and industry personnel. The intent of that conference, the sixth in the series, was to review the scope of public research in forest products and to place such research in an appropriate national context.

We now arrive at the culminating event in this 2-year endeavor: a National Conference in which once again we seek constructive criticism, observations, and recommendations on the needs for research to answer important questions in forestry and related rangelands and to support the policies under which such research is conducted. These research fields are broadly defined to include assessment, management, protection, products, watersheds, range and wildlife habitat, and recreation and amenity values. So this is what we will be about over the next 3 days.

It may be useful to say something about you, the delegates and participants in this Conference. Delegates principally represent organizations which directly or indirectly use the findings of research on forests and rangelands. You will have advice for us as a representative of an organization concerned with timber production, the manufacture of wood or paper products, the provision of higher quality water, better management of range and wildlife habitat, improved human environment or other benefits derived from range and forest. You have a particular interest in research in renewable resources, perhaps as

administrators or scientists, as officers in relevant organizations, or simply as interested citizens. Whatever your background or whatever particular interest you represent, we seek your thoughtful consideration of research needs and priorities.

Some comments on the background of this series of conferences may be of interest to you. Nearly 2 years ago, the Agricultural Research Policy Advisory Committee—advisory to the Secretary of Agriculture and composed of representatives from the Department of Agriculture and from the State land-grant universities—asked the forestry community to undertake a comprehensive program of research planning which would involve the major users of research information. This request was directed particularly to the public sector organizations and agencies involved in forestry and rangeland research. The scientific community in these organizations received this proposal with enthusiasm, recognizing that, with current levels of public interest and the stage of research development in these fields, the request was both timely and eminently reasonable.

You have probably observed that four groups have been represented on the National Steering Committee for these events. One of these is the United States Forest Service, an organization having three major thrusts in its total program, one of which is research in forestry. As the *National Reference Document* indicates, the Forest Service in 1975 had a research program including 934 scientist-years financed by \$75 million. As you would recognize, this is a primary research effort within the U.S. Department of Agriculture. Over the half century since enactment of the McSweeney-McNary Act authorizing a major research effort by the Forest Service, many significant findings have been made and results implemented.

The other groups represented on the Steering Committee relate to university research programs in forestry at a wide diversity of institutions of higher education in the United States. The Cooperative State Research Service, an administering agency within the USDA for Federal funding under the McIntire-Stennis Act, have expanded their efforts. The

Association of State College and University Forestry Research Organizations came into existence following the implementation of 1962 legislation and is composed of the 60 publicly supported forestry schools and experiment stations participating in forestry research under the provisions of the McIntire-Stennis Act. So the second important element in the public forestry research sector is the university component. In 1975, 618 scientist-years were devoted to forestry research at the 60 institutions, with a research budget of about \$28 million, of which about two-thirds were derived from non-Federal sources. This relatively young program also has produced research results of substantial significance to society.

We anticipate that in the next 3 days we can develop statements of national problems to guide research in the 1980's, review the recommendations coming out of the Airlie House policy symposium—and I would emphasize here a concern with more adequate delivery of knowledge—and consider appropriate program levels for forestry and related research. This Conference should also give visibility to the significance of research as related to the management and wise use of that two-thirds of the United States which is forests and range. In addition, all of this activity will lead to regional and national programs of research which will become a part of the activity called for by the Congress in the Renewable Resources Planning Act of 1974. So much for the background.

We have assembled this Conference primarily to get your viewpoints as to how forestry and related rangeland research can best meet your needs. We look forward to receiving your views. Those of us who are a part of the university group producing research, or in the Forest Service in that organization's research arm, deeply appreciate your interest and your willingness to take of your time and to arrange your schedule to permit working with us. We believe you are providing a significant contribution toward the improvement of forestry research in the several States, in the regions and nationally in the United States—yes, even throughout the world.

KEYNOTE ADDRESS



Dr. Richard J. Aldrich, Acting Deputy Director, Cooperative Research, Science and Education Administration, USDA (Formerly Administrator, Cooperative State Research Service)

It is a pleasure for me to be with you this morning as you kick off this National Conference which in a very real sense is the capstone of a joint planning effort that had its beginnings, as Don Duncan indicated, some 2 years ago. It is a pleasure for me because I did have a part in that beginning in my capacity as Administrative Adviser to the Forestry Research Advisory Committee in the North Central Region.

I am sure the majority of you are aware that the regional committees were involved in the early planning that has culminated in this capstone event.

It is important for us to be aware that the planning effort that you folks are involved in is a response to a growing awareness that all research must be meaningful, must be purposeful, must be efficiently managed. In time past, what was done in research was primarily left to the scientist working with his department head or director of the particular research program, whether it was in the university or in a Federal agency. But times have changed. Research has become increasingly complex, often requiring a team approach.

Natural resources, once considered to be practically inexhaustible, we now know are clearly finite. And there are demands upon our forest resources for a wide variety of uses.

One effect of this multiple demand is the necessity to plan together, which is the under-

lying reason why we are assembled here this week—not only those people who are directly involved in the research but also those who use research and those who will be affected by research. For these reasons, you are a diverse group.

In a sense, this planning effort also is a response by the forestry research community to a number of recent reviews of agricultural research performance and policy. One of these was by the House Committee on Science and Technology. This Committee conducted a special oversight review of agricultural research and development. Their report included a number of recommendations on the content and management of agricultural research, including forestry. The recommendations from this report have been responded to by both the legislative and executive arms of the Government. The Congress responded with the passage of the Food and Agriculture Act of 1977, which provides for a considerably broader responsibility in research.

The executive branch has responded through a reorganization in the Department of Agriculture that affects my agency and the Agricultural Research Service. I think many of you are aware that the establishment of the Science and Education Administration (SEA) is imminent. It will become a new agency with publication of the necessary delegations of authority in the *Federal Register*. This likely

will be within the next 10 days to 2 weeks.

This new agency will bring together the Agricultural Research Service which has the responsibility for in-house Federal research, and the Cooperative State Research Service which deals with the research done in the State agricultural experiment stations and other State-cooperating institutions.

SEA will also include the Extension Service and a new dimension—teaching. All of the details for incorporating teaching into this new agency are yet to be worked out because agricultural teaching has been an administrative responsibility of HEW, not the Department of Agriculture, on the Federal level.

But evident in these actions is a strong desire to increase research in the basic sciences that undergird agricultural and forestry research and to focus research on the problems that are most urgent.

A vital part of the total agricultural research program is that concerned with the forest and rangelands. This area of research has important and impressive roots. I am going to review some of these for you, to set a common background for your deliberations over the next 2 or 3 days.

The establishment of a regional forest experiment station in 1908 may be viewed as the genesis of forestry research within the Department of Agriculture. This was followed in 1910 by the creation of the Forest Products Laboratory in cooperation with the University of Wisconsin.

In 1915, a branch of research in the U.S. Forest Service was formed and given a co-equal role with the management of national forests.

Then the McSweeney-McNary Act in 1928 provided legislative authority for the Forest Service's research role and is still in effect as their research authority. Later on in this Conference, we are going to be taking a look at some of the questions of revised authority for forestry research.

Growth of research in the Forest Service has continued over the years, until today there are some 950 scientists with an annual budget of something over \$100 million.

Of importance, too, is the research carried out at the State institutions under the Cooperative Forestry Research Programs—particularly those identified with the McIntire-Stennis Program.

University research on forest and rangelands also has substantial roots. In 1873, the Arnold Arboretum was established at Harvard. The Cornell School of Forestry was established in 1898; and in succeeding years

professors at Harvard, Yale, and Cornell carried out forestry research. Forestry research has also been a part of the research supported under the Hatch Act, originally passed in 1887, which created the State agricultural experiment stations.

But even with these early beginnings, development was slow. It really wasn't until passage of the McIntire-Stennis Act in 1962 that Cooperative Forestry Research in the State universities received direct attention. This Act has had considerable influence on university research. The increased Federal funds brought immediate results in the form of major increases in numbers of scientists and the enlargement of research facilities.

Funds supplied through the McIntire-Stennis program have stimulated expansion of State and other non-Federal funds for forestry research. A related aspect is the provision of a base of scientists. Currently there are some 1,200 scientists and some 2,400 graduate students—future scientists and professional foresters—involved in Cooperative Forestry Research Programs. These programs involve the expenditure of some \$40 million, of which about \$7½ million are supplied under the McIntire-Stennis Act.

There is also important research in forest and rangeland by other Federal agencies. Many of these, I understand, are represented here today. For example, the Fish and Wildlife Service of the Department of Interior conducts research on the biology of fish and wildlife both directly and through cooperative arrangements or agreements with the states. This research is complementary to that done on wildlife habitat by the Forest Service and by the McIntire-Stennis Cooperative Forestry Research institutions.

Important research is also conducted by private industry. Though this is difficult to identify and measure, we know that expenditures for forestry research in industry are substantial and may well exceed those of the public sector. Industrial research has been devoted primarily to product development and marketing, to harvesting, and to processing.

Interest in timber production and resource protection is a good deal greater now than it was a few years ago. This gives all the more reason for a closer relationship between industry, the universities, and the Forest Service in research planning. And we have been pleased indeed to have had leaders in industry research participate directly in the planning process.

Quite distinct from the performers of research are the users of the information gener-

ated. Among these are the groups and the institutions represented at this Conference. Obviously many of the same organizations that use the outputs of knowledge from research also perform research.

We also have a number of groups represented here concerned with the important bearing that research results have on policy decisions. We believe all of you have important things to say about problems that should be addressed by research and the priorities such problems should receive.

Having sketched briefly the roots of the research effort and alluded to the important role that we visualize each of you playing, it is appropriate to address the specific needs we see at this Conference.

We need to begin by reminding ourselves that there are limits to the amount of funding available for research. Thus it is important that available research resources be used efficiently. And it is important that we devote our best efforts to attempting to achieve this goal.

In line with this, the Department of Agriculture and cooperating universities some 10-12 years ago set up a National Planning Committee (NPC). This Committee was viewed as a means of providing policy and guidance for coordinating Federal, State, and, to the extent that we could, industry research. The NPC, with regional planning committees, provides a structure through which coordinated plans are developed for research programs with a high degree of effectiveness and, I think equally important, with a high degree of responsiveness to public needs.

The NPC and its associated sets of planning groups and task forces are based on four underlying assumptions:

- (1) Planning is needed to achieve an effective and efficient use of resources. This planning must occur at all levels—state, regional, and national.
- (2) Planning must involve both the scientist and the program manager and provide for input from those affected by research.
- (3) Planning is a process that must be carried out on a continuing basis. It isn't something that can be done one time and then you are done and can forget about it.
- (4) Planning involves an interchange of ideas and values. It does not provide a rigid road map to specified goals. Thus in a very real sense the unique organizational objectives and responsibilities of institutions participating in the plan-

ning process are enhanced by the planning process.

The procedure involved the creation of the four regional committees. These committees were divided into a number of different program groups. These program groups have responsibility for identifying research needs and priorities.

I want to add a personal note. I think the forestry group has been particularly successful and effective in the first phase of the total planning process. I think you have gone the next mile by bringing together those who have responsibility for programs, having them evaluate the aggregation of their individual projections, and then making adjustments in their individual projections so the total program makes the most sense. I think you have done this very well.

The identification of research needs as perceived by scientists and administrators on a regional level provided the background material that was aggregated into the *National Reference Document*. This *Document* identified the current level of research performed by the Forest Service and those universities associated with the McIntire-Stennis program. It also gave projected research needs in terms of scientist-years, looking ahead to 1980 and 1985.

The viewpoints of the scientists and associated administrators were used as background for conducting four regional user conferences this past summer. This was another important step forward. Users of research were being asked to offer their suggestions as to what problems were the most urgent. These regional conferences identified over 2,000 problems covering a wide spectrum of concerns. The diversity of these problems is further evidence of the need for planning of research in this important area of endeavor.

Some of the problems identified in the regional conferences are definitely of national scope. On the other hand, there are problems identified here that may be of equal or greater importance nationally than those identified at the regional conferences.

One such example is that dealing with the production and processing of forest products. Of similar importance are issues that deal with balancing concerns relating to the environment with the national need for wood to meet housing needs. Overall, we might anticipate that there will be a number of problems that will be identified at this Conference that have either not been identified before or have been ranked low in the scheme of priorities at the regional level.

We feel that the flood of legislation relating to renewable natural resources in the past decade has made the task of determining research needs and priorities even more urgent and complex. We believe that with your help we can do a better job of responding.

For our part, we invite your continued involvement in the planning process. Mid-course corrections will be needed to accommodate the needs of a dynamic and changing society. This Conference should be but one part of an effort to develop a continuing dialog between research administrators, scientists, and users. We will not be able to respond immediately to every need that you identify. This should be clearly understood. Some of the needs that you identify will require resources in terms of people and facilities that we do not possess. Where necessary, we will try to shift the direction of current programs to accommodate these needs with existing arrangements. It is

not our intention to create a monolithic research structure but to provide inducement and encouragement for individuals and institutions to pursue answers to those problems that this and other groups view as important.

Many needs remain to be met in the research process. However, we feel that efforts such as this will go a long way toward filling those gaps that are currently perceived. Equally, we seek your advice on the process itself. In a very real sense we are plowing new ground in the whole planning area.

In closing, we appreciate your willingness to participate in what we hope will be a continuing process. We welcome your suggestions relating to the immediate task of identifying research needs in forestry and related rangelands. With these thoughts in mind, let us press on to the task at hand, confident that our joint deliberations will open new avenues of communication and coordination.

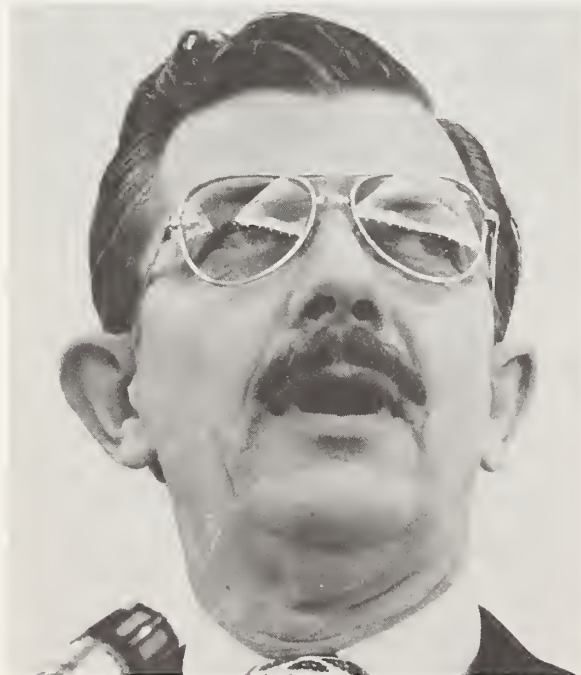


Section II

AN OVERVIEW OF THE RESEARCH PLANNING EFFORT

This section of the *Proceedings* highlights the problem identification portion of the Conference which took place primarily the first day and second afternoon. The specific problems identified were distributed the third day of the Conference and are not included as part of the *Proceedings*. A small supply of the problem documents has been retained by the Forest Service in Washington, D.C. The problems have been used by both regional and national task forces to develop the four regional and the national research programs now available as separate documents. The following speakers describe the planning effort to date and give highlights of the individual work group sessions held the first day of this Conference.

HIGHLIGHTS OF THE REGIONAL CONFERENCES



Dr. John H. Ohman, Coordinator, Regional Conferences; Co-Chairman, North Central Regional Forestry Planning Group; and Director, North Central Forest Experiment Station, USDA, St. Paul, Minnesota

The procedures that we developed and used in the four regional conferences, and that we will be using here during the next 2 days, were brand new. So we really are breaking some new ground.

I would like to acknowledge the good counsel and assistance that we got from Dr. Ned Bayley, of the Department of Agriculture, Agricultural Research Service. Ned gave unsparingly of his time and helped us greatly in developing the procedures we are using.

As Dr. Aldrich mentioned earlier, we already had four regional research planning groups in place. They were asked by the National Steering Committee to develop the four regional working conferences. The purpose of these conferences was to identify and place priorities on the research needs of the wide variety of individuals and organizations that use or are affected by research results related to forests and associated rangelands.

Prior to the regional conferences, planning teams put together background documents for use by the delegates and participants.

The first of these—the *National Reference Document*—covers our current research efforts and capabilities in the United States and provides specific background on the 19 subject areas to be considered. It also includes tentative projections of research effort through 1985. In addition, each region prepared and provided to its delegates and participants a regional reference document in the same format as the *National Reference Document* but containing more regional detail. A third document was the *1975 Resources Planning Act Assessment Summary* which had been prepared by the Forest Service under the provisions of the Resources Planning Act of 1974. This gives considerable background and statistical information on the resource.

In the *National Reference Document*, and in the regional reference documents, we classified all of our research into 19 subject areas. The underlying basis for this classification is the CRIS system, the Current Research Information System, of the Department of the Agriculture. But, as with any classification system, it has its faults. The 19 subject areas are *not* so independent as they may appear. I am sure there will be a lot of discussion during the work group sessions that bears on what I am saying now. The point is that we do need some way to classify our research. It works reasonably well. But we must understand that research in timber processing might have very large effects and wide implications for wildlife, timber management, environmental values, and a variety of other things. Many problems

that we cover are not mutually exclusive. Many, many of our research programs now are multidisciplinary. This is the way it goes in research nowadays.

To cover the highlights of the four regional conferences, I need to speak a bit about the procedures. First of all, we had delegates, as we do here. We used a matrix, as we did here, to develop a list of organizations that we would invite to provide delegates within each of the work groups. This was very carefully developed in order to achieve a balance of interest groups within each subject area. At each of the regional conferences there were about 70 delegates—10 per work group.

Delegates were asked to submit problems prior to the conference. These were lightly edited by the conference staffs and then entered into a computer. Lists were then provided to all delegates prior to the conference.

During the work group sessions, additional problems were submitted by delegates or participants. The delegates then determined the final list of problems to be considered within each subject area.

Delegates and participants were asked to rate each problem on a 1 to 5 scale, ranging from 1, of very little importance, to 5, of utmost importance. We asked them, and will ask you today, to be discriminating.

Not all problems could possibly be No. 5. Not all problems could be No. 1. This resulted in a priority listing within each subject area of the problems submitted.

In a plenary session we asked the delegates and participants, using the same 1 to 5 scale, to rate the 19 subject areas. We used this rating to provide a normalized listing for all problems. There were about 50 problems developed at each of the conferences. This gave us a normalized listing regardless of subject area. It also gave research administrators a picture of the relative importance of certain specific lines of research.

The composite listing that you received in your registration packet is a listing of 190 top priority problems from the four regional conferences. This is a good indicator of the similarity among the regions. The top 10 priority problems in each of the 19 subject areas—there were 190 on the composite list—cover about two-thirds of the 2,013 individual concerns developed in the regional conferences.

There was a high degree of similarity among the regions. There were few large differences in the average ratings of subject areas. Average ratings of greater than 4.0, which would be of major importance, occurred only three times in the regional conferences. Resources

inventory and appraisal at the North Central and at the Southern were over 4.0, as was watershed protection and management at the Western conference. Scores below 2.0, of minor importance, occurred only once: management of range resources in the Northeast conference. The great majority of the ratings—over 80 percent—were in the 3.0 to 3.99 range (important).

There were two common themes which cut across all subject areas. One was the need for better ways of getting research results into practice. Statements such as "Improved techniques for transmitting management research findings" or "Improved research information delivery systems for identification, prevention and control of tree diseases," are sprinkled liberally throughout the conference reports. The same need was brought home to us in more subtle ways. Some of the top-ranked problems submitted and evaluated by users covered problems on which we already have a considerable amount of information available.

Energy was another very common theme in all the regional conferences. Statements such as: "Reduce energy requirements in harvesting and transporting forest products," "develop methods to use wood as an economical energy source," and "analyze the effects of energy supply on future outdoor recreation activities," were common.

User needs are one of the most important inputs to the planning process, but there are several others that must be considered before we develop our "final plans or objectives." As Dr. Aldrich pointed out, research planning is a continuous process.

There were several other events besides these conferences that have helped get us where we are today in defining research needs. As mentioned earlier there was a symposium on research policy. You will be hearing more about that in the third day of the Conference.

This National Conference is another input to the process. And it will not be the last. We

need scientists' evaluations of the output of these conferences. And, finally we will have to have decisions by research administrators.

The regional planning teams have already assigned regional task forces of scientists to consider the output of the regional conferences.

Their first step is to check the classification of each problem.

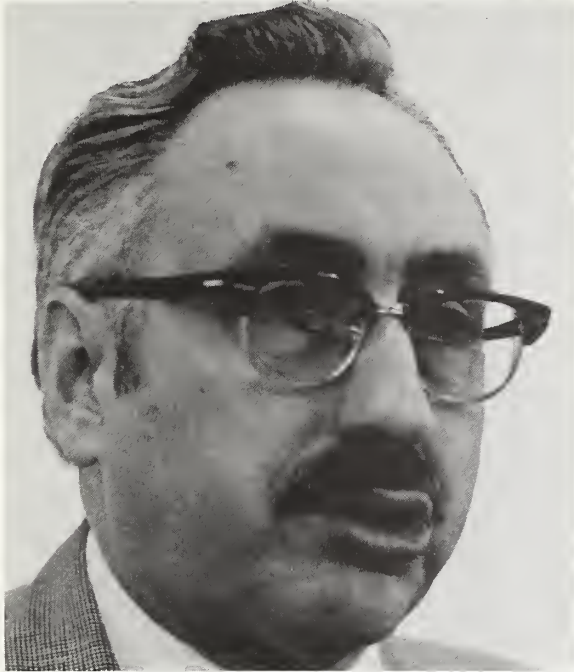
Their second task is to determine whether or not the problems are researchable. Some of the problems are policy problems—problems which could be solved by a change in policy, existing law, or regulation. These don't need research. This is not to say they are not a problem and of concern to the user, but simply that they don't require research. Some of the problems are information or education problems. Others are simply statements of belief or opinion.

Next the task forces will evaluate the scientific opportunities and likelihood of successful solution of those problems that were evaluated as researchable problems. And we have asked them to combine similar problems and to rewrite others in order to make them more clearly understood by the scientists who would use them.

I emphasize that what the regional task forces are doing is a first cut. Much of what they do will be modified by what happens here. We will have national task forces to consider the results of this Conference. I feel strongly that the role of these scientist task forces is extremely critical to the ultimate success of this entire planning effort, because the credibility and acceptance of our final plans by both the research users and the research doers depends to a very great extent on the ability of the scientist task forces to translate your user concerns into the interests and capabilities of research doers.

We are looking forward to the results of this National Conference so we can get on with the job of developing our research plans.

ORIENTATION AND PROCEDURES



Dr. Richard A. Skok, Coordinator, Regional Conferences; Co-chairman, North Central Regional Forestry Planning Group; and Dean, College of Forestry, University of Minnesota, St. Paul, Minnesota

I have been assigned the task of weaving together the procedures and orientation to be followed during this Conference. Much of this has already been noted. We want all of you to have a common understanding of what is going to happen during the next 2 days.

This Conference deals with the issue of forestry research needs of a national scope. The identification and the labeling of priorities of these needs for the decade ahead as seen through your eyes as users of this research is the task of the first two Conference days. Scientists and research administrators both in the Forest Service and the schools will find useful direction in what you have to tell us during this period.

Assembled for this Conference are approximately 100 delegates representing user organizations who have need for this research. They are identified by the green name tags they wear. Also among the delegates are 28 individuals who represent the four regions of the country where conferences were held in July 1977. These individuals either served as the work group chairmen at the regional conferences or represent the group in those cases where the chairman could not join with us. These individuals are here as representatives of their region and not primarily as representatives of an organization as they were when they participated in the region.

The remaining 72 delegates have been se-

lected by their organizations to represent them at this Conference. These organizations were selected by the National Steering Committee to provide a balance of user interest representation.

In addition to the delegates, two other groups of attendees are recognized by their name tags. Those individuals—with white name tags—represent either alternate regional delegates or invited participants, individuals with a varying interest in forest and rangelands. Their roles will be described a bit later. Those having white name tags with ribbons attached are Conference staff members. They are here to assist you in a variety of ways.

During the first day of the Conference, most of the activity will be focused around the work group sessions. In these sessions, delegates will discuss the research problem needs submitted for a given subject area, make changes or deletions in these problems, and add other problems which they believe should receive research attention.

Prior to the Conference, delegates were requested to submit research problem needs they considered to be of importance. Those problems, along with the 190 composite problems identified earlier that resulted from the regional conferences, serve as the basis for work group and subject area deliberations the remainder of this first day.

Delegates will rate the problems finally

agreed on for each assigned subject in their work groups. The rating is to reflect the level of importance each delegate attaches to each problem. The set of problems you received also serve as your rating sheets to be used for this purpose.

We are not seeking a work group consensus. I emphasize this. Rather we seek your individual priorities after having heard the group's discussion. Ratings are by numerical scores from 1 to 5, with 5 representing your judgment that the item is "of the utmost importance" and 1 indicating that that item is "of very little importance." The numbers in between represent gradations of importance. A zero rating will be counted as "no opinion."

The delegate ratings of problems will be entered into the computer for analysis. Results will be made available within 24 hours. The results will display the average rating of delegates by subject area for each problem, a weighted average of that problem's rating within the work group, and a ranking of problems within a subject area.

In rating problems, we urge you to be as discriminating as possible.

The primary mission of this first day then is to obtain a set of delegate-determined research problem needs with a sense of their priority as seen by you, the delegates.

Participants and alternate delegates of the Conference are also invited to attend work group sessions. They will be given an opportunity to rate the problems if they so desire, and their ratings will be handled separately from those of the delegates. Because of time constraints, the results of their ratings will be analyzed after the Conference is concluded.

The work groups and subject areas chosen closely correspond to the classification of the Current Research Information System (CRIS) mentioned by previous speakers. The CRIS system is used by the Forest Service and universities nationwide for reporting research activities, summarizing current research effort, and as a basis for projecting research needs for forests and associated rangelands.

A word now about selection of delegates. Delegates to this Conference were selected by *their* organizations for specific work group assignments. Within a work group, delegates represent an attempt to obtain some diversity of user interest. This is by design of the National Steering Committee.

Each work group will be chaired by an individual who is a regional co-chairman of the Forest Resources Planning Group. In addition, each work group will have three secretaries. The work group chairmen and secretaries

are here to assist you in the conduct of your work group sessions and to guide you in arriving at decisions. It is *not* their role or purpose to make decisions for you with respect to the nature and importance of problems.

Tomorrow after the work groups have completed their assignments to identify and rate research problem needs, delegates will meet in Plenary Session II where there will be discussions concerning new initiatives and major thrusts in forestry research.

At Plenary Session III tomorrow afternoon, the results of your work group ratings of today will be presented; and the work group deliberations will be summarized by the chairmen. Delegates will then be asked to rate the 19 subject areas. These ratings again will be made on a scale of 1 to 5.

Participants will again be able to rate subject areas if they so desire, but as earlier, the ratings of delegates and participants will be handled separately. The subject area ratings by delegates will be entered immediately into the computer and provide a means of weighting problem ratings across work group subject areas. The ranked results of research problems by subject areas, based on the combination of delegate ratings for problems and for subject areas, will be printed and provided to all in attendance at the third day of the Conference. A brief discussion and explanation of the report will occur at that time.

Finally, it is important to re-emphasize the purpose of the Conference and the role of the delegates for these first 2 days: to identify and prioritize research needs of a national scope for forest and associated rangelands based on the views of a cross-section of users of this research.

This Conference seeks to supplement the results obtained from users at the regional conferences where attention was necessarily focused on regional-level problems. This is important because many problems are significant at the regional level but not necessarily at the national level.

The results of the regional conferences and of the National Conference provide helpful user insights into the total planning process for development of the research programs of the Forest Service and the forestry schools in this country.

User input, along with scientist and research administrator judgment, are necessary to insure both the relevance of the research we undertake as well as a sense of where the best scientific opportunities exist and the extent of researchability of problems.

Thus an overlay of perspectives is sought to the planning process. The national and regional conferences provide us with a scope of user views that has not previously existed.

I would like to echo what other speakers have said. We sincerely appreciate your at-

tendance and participation. I know from discussions with several of you that there are important items of business that you left at your offices to be with us. We do appreciate that fact and wish you well in the next 2 days of your activities.

PROBLEM AND SUBJECT AREA RATING



Dr. Irving Holland, Co-chairman, National Working Committee; and Head, Department of Forestry, University of Illinois, Urbana, Illinois.

We think that one of the interesting features of our regional workshops held last summer, and of this National Conference, is the making available to the delegates and participants the data and results generated by your deliberations yesterday.

Before we hear the work group presentations this afternoon, I would like to tell you what we have done with your problem ratings. We have generated a value for each problem in each subject area that gives us some idea—and I underline *some* idea—of its importance relative to all the other problems in the subject area.

I would like to offer a word of caution concerning the interpretation of problem rank. Just because a given problem in a subject area comes out with a top rank or near top rank may not mean really and truly that it is the most important problem in that subject area.

What we *can* say with some assurance is that in the opinion and judgment of delegates in the work group and participants, those problems with average or higher values are probably more important than the rest.

What we have done in manipulating the data from you is to permit the identification of at least two classes of problems within a subject area.

One class includes those that are probably more important—because their normalized values are greater than the average of all the problems in the work group—and those that are probably less important, because their normalized values are less than the average of all the problems in the work group.

To complete the data manipulation process, delegates and participants separately will be asked to rate each of the 19 subject areas using the same 1 to 5 rating scales. This allows us to get around some biases and to normalize the data a second time.

The ranking of problems within subject areas remains undisturbed. But it will thus become possible to once more identify those problems of higher importance from those of lower importance as judged by the combined wisdom of all the delegates where all 19 subject areas are concerned.

HIGHLIGHTS OF THE INDIVIDUAL WORK GROUP SESSIONS



PRESIDING: Dr. George M. Browning, Member, Steering Committee; and Regional Director, North Central Region, State Agricultural Experiment Station Directors

The next seven speakers are the chairmen of the individual work group sessions conducted yesterday. Each speaker will highlight the deliberations that took place in his work group. After these presentations, the delegates will rate the 19 individual subject areas.



WORK GROUP I— MULTIRESOURCE INVENTORY, APPRAISAL, AND EVALUATION

Dr. Robert G. Merrifield, Chairman, Work Group I; Co-chairman, Southern Regional Forestry Planning Group; and Acting Head, Forest Science, Texas A&M University, College Station, Texas.

Our working group did not like the way the problems were written, so they rewrote a lot of them. Nevertheless, the net effect was a gain of only two problems. The regional conferences did a good job in problem identification.

The first subject area—Inventory and Appraisal—came out with very high scores. The major thrust of high priority problems was directed toward development of rapid economical, multiresource inventory systems. This is very strong and very clear.

The other problems that emerged dealt with specific informational needs, such as the availability of timber from commercial forest lands, comparative economic values of forest resources, and determining productivity potential of forest lands. The delegates also directed the research community to pay attention to methodology and to use the most advanced technology in getting and processing inventory data.

For Subject Area 1B, Alternate Uses of Land, the common thread of interest was to identify that very broad array of consequences that result from various alternate uses of land. Obviously, major attention was given to forest land and its associated resources. But environmental, social, economic, and political considerations were also identified as impor-

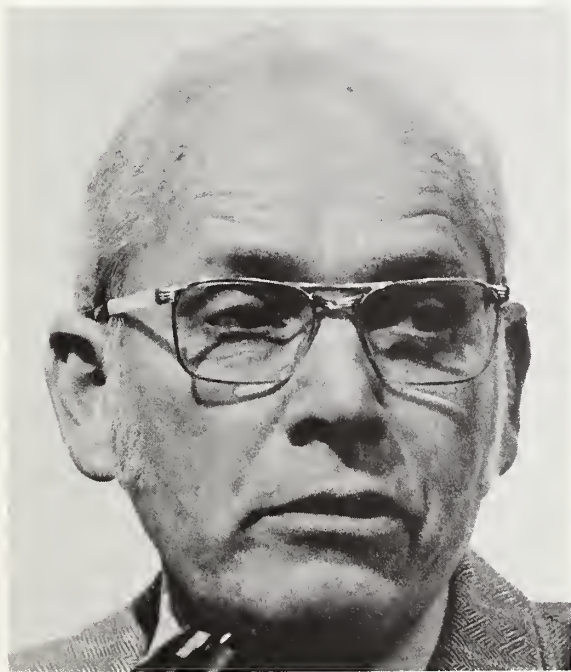
tant variables in this land-use equation. Specific attention was directed toward the public policies which affect forest management on privately owned land.

Our final subject area—Multiple Use Potential and Evaluation—involved a long plea for the development of working models which will assist the forest manager in the highly delicate and complex task of multiple-use management.

There was particular interest in research which would provide analytical tools for trade-offs between two or more uses for forest land. As was the case with the subject area Alternate Uses of Land, there was a broad range of variables such as social, economic, and environmental, identified that should be evaluated in a multiple-use context.

I think the picture is quite clear that the first order of business is to get on with the research in inventory and appraisal.

Obviously, the techniques to be developed in the other two subject areas, as well as the other 16 for that matter, are largely dependent upon an adequate and reliable source of quantitative information. I think our charges to the research community are quite clear in this case.



WORK GROUP II—TIMBER MANAGEMENT

Mr. Rudy M. Kallander, Chairman, Work Group II; Co-chairman, Western Regional Forestry Planning Group; and Assistant Dean, School of Forestry, Oregon State University, Corvallis, Oregon

The subject area Biology, Culture, and Management of Forests and Timber-Related Crops was the first discussed. Specifically, delegates reviewed 23 original problems, deleted only 1,

and added 8 for a total of 30. Delegates expressed their greatest interest and concern in problems dealing with: development of yield tables or growth simulators to facilitate man-

agement, economic analysis to guide investments, and improved yield data from planted and natural stands. Of equal concern was research to determine efficient and safe means of applying pesticides. These were followed closely by the need for improved capability to maintain forest-site quality under intensive management and successive clear-cuts, development of timber management guides for major commercial tree species, and environmentally acceptable fertilizer prescriptions by soil and timber types.

The top ten in this subject area were rounded off by the expressed need for improved information delivery systems for small forest land owners.

The subject areas dealing with Genetics and Breeding of Forest Trees are much narrower. Twelve original problems were examined, none was deleted, and three new ones were added, for a total of 15. Delegates discussed the financial and time commitment that many genetics studies require. They pointed out the need for sound review and planning prior to selection and initiation of research.

Ranking high was the need for expanded research in: tree breeding for disease resistance in major commercial species; improved economic analyses and evaluation of genetics programs to guide research and operational investments; growth and yield information for genetically improved trees; insect and disease resistance in seed orchards to reduce cone, seed, and growing-stock losses; early evaluation techniques to select for genetic gain; increased quality, growth, and yield of commercial tree species; genetic criteria to enhance quality of natural regeneration; increased flowering and seed production in seed orchards; and breeding strategies for advanced or succeeding generations of genetically improved trees.

Probably the most spirited discussions occurred during deliberations concerning the Economics of Timber Production. The discussions centered around the pressures of inflation and high cost of energy.

Uppermost in delegates' minds was the need for research to determine the impact of public forest policies on long-run timber supplies; measurement standards to determine impact and effectiveness of programs designed to improve productivity of forest lands in small private non-industrial ownership, and recommendations for more equitable systems of taxation including inheritance tax laws for managed forest lands.

Also considered important was research on yield tables or growth simulators to facilitate management and economic analysis to guide investments. If that problem sounds familiar to you, it is. It happened to be in the first subject area on Biology, etc., right at the top of the list. In the third subject area on Economics, etc., it also showed up as a high priority. All told, the delegates discussed some 24 original problems, deleted 6, and added 7, for a total of 25.

The economics of forest management on different sites and with different ownerships drew substantial support. Yield tables by multiple products from planted pine, reflecting thinning and fertilization effects etc., were also rated important.

Updating yield tables for all timber types in managed forests also gained support.

The sense of the group discussions was that research must play a vital role in assuring future timber supplies for our Nation. Research must lead the way in helping to find economical and efficient ways to grow more timber on less land to meet increasing demands of a growing population. This must be done in an atmosphere of mounting costs, decreasing energy supplies, and increasing governmental constraints at all levels. It must be done in ways that enhance or have the least impact on the forest environment.

That is a large order, but if we plan together, determine the best approaches to solving our problem, use the body of knowledge already available to us, and share in getting the job done, we are confident future timber supplies can be assured.



WORK GROUP III—FOREST PROTECTION

Dr. John H. Ohman, Chairman, Work Group III; Co-chairman, North Central Regional Forestry Planning Group; and Director, North Central Forest Experiment Station, USDA, St. Paul, Minnesota

We added only 19 for a total of 49—19 to the 30 protection problems that were in the composite list of 190. All of the original 30 are included, then, in the 49. Several of them were rewritten, but the original meaning remains.

There was considerable discussion of the need to better evaluate the impact of all three of these subject areas; and to find better ways, better methods, to express first what these impacts are and how serious they are.

Another very common theme in the discussion came from the forest managers in the group who stressed that they wanted a much larger bag of tools in order to decide, first of all, whether or when to take control measures. Then, if control measures were necessary, they wanted to have a wide range of methods for dealing with these pests. Given the situation and all the other variables, they did not want to have just one or two options available.

Cultural control of both insects and diseases was considered very important. The delegates urged a reemphasis of cultural control for insects and disease.

Our group, as was so common in all the regional conferences, stressed the need for improved research information systems in all areas—fire, insects, and disease.

There was considerable emphasis on the development of economical and environmentally safe control measures. All agreed that

anything that we used had to be environmentally safe.

It was felt that it might be a good idea for the work group to give us some idea of what their priorities were on specific insects or diseases of national significance. In insects, for example, we identified the gypsy moth, the southern pine beetle, the spruce budworm, the mountain pine beetle, the white pine weevil, canker worms, and the tussock moth. In diseases, we identified Dutch elm disease, root rots, dwarf mistletoe, beech bark disease, scleroderris, and fusiform rust.

Another problem that surfaced during our discussion of insect problems and led to considerable discussion was the need to develop better methods for aerial application of pesticides, including herbicides. This is a problem that will appear in the insect listing, but it could well apply to several other subject areas.

In our discussions of fire, we added very few problems. One thing that came out as being quite important was the need to get a better handle on the other values that were protected from fire—the non-timber values.

Current methods of determining values are based almost solely on timber. We felt that this is erroneous and not very helpful to the managers in making their decision on whether and when to control. The group also added a problem in fire; smoke management and the effect of smoke on environmental quality.



WORK GROUP IV— HARVESTING, PROCESSING, AND MARKETING OF WOOD PRODUCTS

Dr. Robert L. Youngs, Chairman, Work Group IV; and Director, Forest Products Laboratory, USDA, Madison, Wisconsin

In our definition of problems in Harvesting and Forest Engineering Systems, environmental considerations, small private ownerships, safety, efficiency of both harvesting and timber use, economics, and energy all figure prominently.

Recognizing that harvesting techniques provide the means for exercising options in timber management and use of timber resources, the group assigned especially great importance to the development of efficient and environmentally acceptable systems for harvesting small woodlots and other nonindustrial private ownerships.

This consideration also reflected itself in problems dealing with maintaining and improving soil productivity, and harvesting difficult areas. Concern for the safety and availability of those who must carry out harvesting operations was indicated by the importance assigned to developing safety standards and determining effects of harvesting systems on manpower availability.

Maintaining and increasing timber supply was a concern reflected in the significance attached to research on improving timber use, use of logging residues, and whole-tree chipping.

Economics figures prominently in our deliberations, resulting in considerable importance being attached to breakeven analyses, determination of impacts of regulations, and other factors relating to harvesting practices.

Energy concerns were reflected in several

problems relating to increased use of wood for fuel and increased energy efficiency.

Many of these same concerns, plus others, were carried through into our discussion of research needs relating to properties, processing, and protection of wood. In this area, as in the first, timber supply, environmental considerations, energy, and economics were closely linked in a number of problems assigned particularly great importance. Many of these deal with developing environmentally and economically acceptable ways to improve use or disposal of processing residues. Use options considered ranged from high performance wood products to fuel.

Increasing timber supply and forest management options were also reflected in assigning major importance to improved use of hardwoods, especially low grade hardwoods. Another approach to effectively increasing timber supply is by increasing the useful service life of wood products.

Concern for this was expressed in the assignment of significance to problems of wood protection and preservative treatment. Problems so identified range from reducing deterioration of logs in storage to developing alternatives to present wood preservatives, including non-chemical control methods. Special attention was also given to improving fire resistance of wood.

Reducing the drain on supplies of structural timber can be accomplished by efficient engineering and design. This was recognized in

the importance attached to determining engineering properties to support adequate assessment of material properties and engineering design.

Improved adhesive systems were recognized as the key to enable production of high-quality products from low-quality wood and residues.

The growing concern for energy was reflected in the significance attached to developing energy-conserving wood structural and wood processing systems, as well as to coordinating the use of wood and other fuel sources to meet industrial needs.

Some basics came out, too, especially in regard to improving our understanding of lignin and ways of breaking it down biologically for improved pulping processes.

Considerations of economics and marketing were highly integrated into other areas discussed. However, special significance was attached to determining economic impacts of many important policy and administrative factors, such as withdrawals of commercial forest land, intensive management practices, log exports, federal timber management and sales

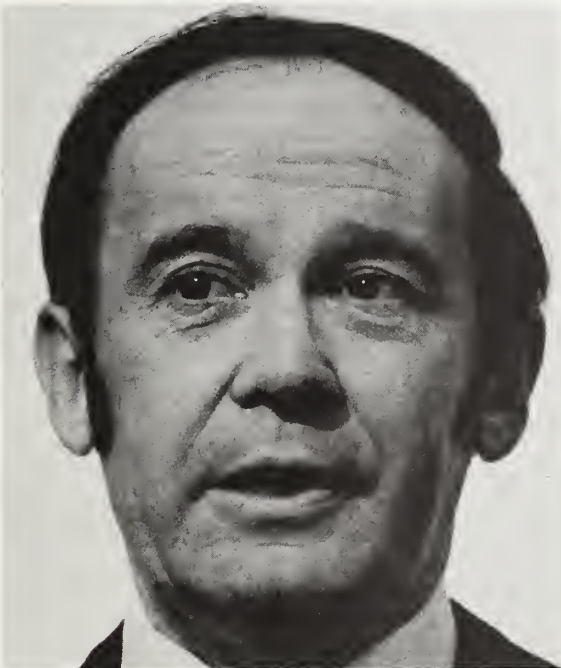
policies, and environmental controls.

The group identified several problems in the economics of more effective wood use and in conveying to those who need the information on economics and marketing of wood products.

In a slightly different vein, the group assigned much significance to strengthening the efforts of research organizations to assess the potential payoff from research before projects are initiated, or a means of optimizing the returns from research investments.

Coming through even more clearly, I think in these deliberations than in the regional conferences were indications of the key role that research in harvesting, processing and product economics must play in solving major problems of plant managers and of timber supply.

Success in the research areas identified can help provide economic options for removal of biomass from lands not now being harvested so that the land can be better managed through reforestation with desired tree species. Also, success can contribute significantly to short-term increases in timber supply.



WORK GROUP V—FOREST WATERSHEDS, SOILS, AND POLLUTION

Dr. Roger R. Bay, Chairman, Work Group V; Co-chairman, Western Regional Forestry Planning Group; and Director, Intermountain Forest and Range Experiment Station, USDA, Ogden, Utah

The range of our work group discussions should give you an idea of the scope of research dealing with forest and range watersheds, soils, and water pollution. I think we touched upon subject areas probably mentioned in every other work group: inventories

of soils, fire effects, timber-water interactions, the impact of recreationists on water or soil quality, and many other related subject areas.

Within the area of watershed research, we noted the need for some basic work, but primarily our group related to the more imme-

diate and near-term needs of users. Traditional watershed research in the university system and the Forest Service in the past has tended to concentrate on water yield or protection type of activities, including a limited amount of soils work.

But there is more than that to forest and range watershed research. Studies of water and soil quality, the influence of harvesting and roadbuilding systems on water quality, the effect of waste disposal on water quality, and nonpoint source pollution associated with forest and range management all fall under watershed research.

Erosion control, including research in mined-land reclamation, is also included in the classification of the USDA and the university system. Snow management, too, is part of watershed research.

The interactions between rangeland management and soil and water quality, and nutrient cycling in forests and rangelands, are included in the classification of soil and water research. Forest and rangeland production are certainly dependent upon the basic soils resource. The effect of fire on the soil nutrient capital as well as on the physical properties of soil is another subject in this classification.

The third area we generally discussed concerned the alleviation of soil, water, and the air pollution problems, including waste disposal activities on forests and rangelands. Disposal of sewage and other types of waste materials on forest lands is identified in this subject area because the scientific disciplines of hydrology, soils, and plant physiology are found in the watershed and soils departments of universities and Forest Service research.

We saw a general need to develop methods, techniques, data, and the knowledge itself to enable our users of forest and range lands to

protect water quality. We need guidelines to prevent nonpoint source pollution, guidelines to control erosion and consequent sedimentation, and guidelines for the use of forest and range lands for the disposal or recycling of various types of waste products. This latter item was rated highest in two of the subject areas.

We also talked about the concerns of knowledge transfer—both ways, from the researcher to the user and also the user transmitting his need back to the researcher. It came up again in all three subject areas.

We dealt with some problems that address the need to protect overall environmental quality but still enable the production of goods and services—to allow the use of forest and range lands. The economic aspects were brought into the problem statements. Under technology transfer, we recognized the need for better use of our present knowledge and early use of the newly developed knowledge in the future. Thus, we see a strong need for improved technical assistance and delivery systems to help the managers protect and manage natural resources.

In summary, the work group gave their support to research for dealing with the managers' and users' problems, particularly the immediate problems facing today's users. But we did not ignore the important fundamental and basic problems, either. And the group felt we had to be concerned with how we can ameliorate, or mitigate, potential adverse aspects so we can get on with the use and management of our natural resources.

Environmental protection, economical methods in managing, and the transfer of knowledge both ways between researcher and user appeared to be the three major areas of discussion.



WORK GROUP VI—FOREST RANGE, WILDLIFE, AND FISHERIES HABITAT DEVELOPMENT

Dr. Laurence E. Lassen, Chairman, Work Group VI; Co-chairman, Southern Regional Planning Group; and Director, Southern Forest Experiment Station, USDA, New Orleans, Louisiana

Neither wildlife interests nor livestock interests were particularly anxious to claim wild horses and burros. But I think we solved the problem by specific mention of wild horses and burros as needed problem statements.

As happened so often in the regional conferences, the need to improve research dissemination was put as a challenge to public research administrators.

The group also noted that, in many areas, a bank of research information is available for use. It's not being used because policy decisions have to be made to get the information into practice. The suggestion was made that we need research to evaluate the effectiveness of public involvement processes such as this one. Public involvement needs to be evaluated as to how well it meets the intent of recent legislation and public policy; and, also in terms of the mechanics of the process.

Several members joined in emphasizing the need for more attention to basic research. One of the initiatives that Keith Arnold expressed this morning was that basic research not be diminished in favor of the world of modeling. The comment was made that researchers should not fall into the trap of letting modeling become an end unto itself. The feedstock for modeling is produced from basic research.

Regardless of the specific problem or area of interest—whether it be range, wildlife, or fisheries—we must always match the land to the resource. Again, the work group—no matter what their special interest or

background—favored the regional system approach.

A regional plan was made to recognize the present and potential impact of the Southern range. Our attention was also drawn to the acreages of farmland in the Northeast which are reverting to brush and forest. In the latter case, the thought was that we have a situation developing that is not widely recognized but which affects wildlife, fisheries, and range use.

Emphasis was given to joint considerations of range and wildlife research, rather than treating them as incompatible subjects. The impact of designating ever more acreages to wilderness was a concern to delegates representing wildlife and livestock interests. They wondered what the impact on resource management might be.

Also in our discussions persons representing wildlife and range interests expressed considerable concern about the impact of water management on livestock and wildlife habitat.

Social aspects of natural resource issues were mentioned as an area lacking in research.

Research on prescribed fire related to both range and wildlife management drew strong support.

Evaluation techniques to permit economists to deal with the value of wildlife, particularly the nonconsumptive values, need research and development.

And finally, the lack of problem submissions emphasis and discussion of issues related to

predators was noteworthy. I don't believe we discussed a single issue dealing with predators, or had a single problem on the topic. The lack of problems dealing with threatened and endangered species and the lack of discussion concerning energy problems is also worthy of note. We did touch upon those issues slightly, but to a much lesser extent than I expected.

Turning to the problem rating, in the wildlife and fish habitat areas, we changed 8 of the first 10 problems listed from the regional conference groups. We also added a number of new problems. And we changed the wording of some of the other problems. The top problem in the wildlife and fish habitat subject area called for development and evaluation of pre-

scribed burning techniques for improvement of wildlife and livestock habitat. Other problems raised called for analyses of the impact of livestock grazing on wildlife communities.

There was only one problem that scored over 4 points. Remaining problems were all within the 2-point range.

Turning to the range subject area, again we changed 8 of the top 10 problems by either rewording, adding, or subtracting problems. The top problem was the need to develop a national system for identification, classification, and inventory of range eco-systems including past and present site potential, condition, and realistic opportunity for improvement.



WORK GROUP VII—FOREST RECREATION AND ENVIRONMENTAL VALUES

Dr. Hugo John, Chairman, Work Group VII; Co-chairman, Northeastern Regional Forestry Planning Group; and Director, School of Natural Resources, University of Vermont, Burlington, Vermont

The scope of deliberations by this work group was necessarily broad—encompassing the social, economic, and biological areas as well as spanning both the urban and rural perspectives and considering resource availability from both public and private lands.

In the social context, there were questions raised about the need to make our recreational areas more accessible to all members of society and perhaps provide them a better environment. When we say "all members of society" this includes the handicapped, both physically and mentally. We talked about the disadvantaged, the minority, the inner city resident. The need for facilities for the handicapped was raised—not for separate facilities but rather, how do we modify our existing facilities

to meet their needs? Included in the social area were questions related to finding ways to assist recreational users to better use, understand, and enjoy the forest resource.

Carrying capacity of the resource in both the physical and biological sense is an area that was dealt with, along with the care and capacity from a social perspective. In a similar vein, for example, we discussed power boats versus canoes or kayaks, snowmobilers versus cross-country skiers. The conflict issue also touched upon private commercial enterprise versus private party use.

Economic issues ranged from the tradeoffs between the commodity outputs from resources and noncommodity outputs and amenity values from the same resources. Of course,

there were questions as how to objectively measure values and outputs. It was pointed out that we use only "visitor-days" as a measure in justification when there are many other measures which might be used—if research could develop them. The economic issues went beyond just recreation and included shelterbelts and open spaces.

Urban issues relating to nongame wildlife and the planning of open spaces were of importance; these included neighborhood and community involvement in the planning, development, and maintenance of urban recreation areas.

Problems relating to the establishment and maintenance of vegetation in urban areas were discussed, as was the need for more genetically tolerant species to withstand environmental impacts, and the need to develop more cost-efficient and effective management techniques.

The role of private land in providing recreational opportunities and environmental values was considered. The provision of public trail access across private lands to connect various public areas is important and has great potential to add to the trail system. The possibility of this being treated in the same context that we treat powerline rights-of-way was expressed.

The highlights of this work group's thinking

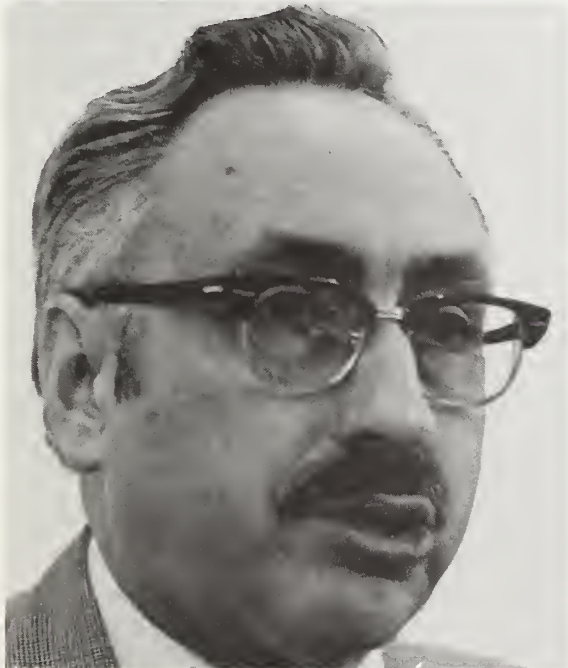
are reflected in the problem lists provided. Of specific concern was research on objective measures of the values of recreation and the environment, and research examining the multiple resource production from forested land, the tradeoffs among various products, and an increased understanding of the social values.

Technology transfer—information dissemination to both the resource manager and user—came to the surface with high frequency and priority in all areas. A new twist of this was not only technology or information transfer to the user of research, but also to the user of the resource so they may better use the area and understand it.

John Ohman pointed out the interdisciplinary nature of the work groups and subject areas and their overlap. If you will check through your whole problem listing, you will find that 11 of the areas had problems listed which alluded to recreation. This is further indication of the interdependencies that exist.

In our particular work group you will find problems about genetics, physiology, disease, fire—all topics which cut across a great many areas. The economic tradeoffs and cost-benefit ratios also come up with high frequency and are rated as highly important.

RESEARCH PLANNING ACTIVITY OVERVIEW



Dr. Richard A. Skok, Coordinator, Regional Conferences; Co-chairman, North Central Regional Forestry Planning Group; and Dean, College of Forestry, University of Minnesota, St. Paul, Minnesota

I cannot talk about a brief overview of the entire planning effort, because I am not yet sure we exactly understand what that is. I am, however, going to try to speak to what we have done so far, and what I think our intentions are from this point on. I don't think there is anyone in the room who needs to be convinced about the importance of the forest resources to the people of this Nation for economic, environmental, social, and cultural reasons. Research has already contributed much to ensuring continued growth and productivity of the Nation's forests and associated rangelands. Dynamic planned and comprehensive national and regional research programs are required to assure continuing and optimum benefits from our forests and associated rangelands.

Given increased funding needs and scarcer tax dollars, it is imperative that those of us associated with the conduct of programs of forestry research in the public sector be aware of: (1) The relevance and importance of the research needs addressed; (2) the cost-effectiveness of our efforts, and (3) the coordination of activities among the various research institutions and scientists.

These concerns place a growing importance on research planning. Coupled with these obligations, which are incumbent on all public research agencies, is the impetus and opportunity provided by the Forest and Rangeland Renewable Resources Planning Act of 1974. The RPA, as this Act is called . . . "provides for a long term perspective in planning and undertaking national renewable resource programs for forests, range and other associated lands."

To accomplish this perspective the legislation requires periodic assessment, analysis, and program identification by the Forest Service. Multiyear programs submitted to Congress provide a basis for considerations of multiyear funding. Research represents one of the RPA program components. The Forest Service is now in the process of seeking public input for its 1980 RPA program submission. This Conference will contribute to that end. While the RPA focuses on programs for Federal lands, it also provides for Federal-State joint effort to identify and meet the non-Federal land needs.

Given these circumstances, the Co-Chairmen of the Agricultural Research Policy Advisory Committee called for development of a national program of research for forests and associated rangelands in mid-1976. A National Steering Committee is comprised of one representative each from the Forest Service, the Association of State College and University

Forestry Research Organizations, the Cooperative State Research Service, and the Regional Directors of the State agricultural experiment stations.

The Steering Committee is seeking, through a series of activities over the past 20 months and in the period ahead, to examine research in terms of program content, policy for conduct, and effectiveness of efforts.

The initial steps involved establishment of constrained projections of scientist-year, by research subject area on a regional basis, to the years 1980 and 1985. These projections—made by research scientists and administrators—used the overall 1980 and 1985 research budgetary levels established in the 1975 RPA program as the research program target for the Forest Service. A growth target for the forestry school research over the planning period was mutually agreed upon for planning purposes. The intent of this target was to bring the forestry school effort approximately equivalent to that of the Forest Service by the year 2000.

At this point, I would like to briefly comment on the "scientist-year"—the basic unit of measure for reporting and projecting research needs in our planning structure and documents. A "scientist-year" unit represents a full-time equivalent scientist of GS-12 rank or above in the Forest Service or of assistant professor rank or higher in the universities. A "scientist-year" can be converted to a dollar equivalent which includes the scientist's salary, fringe benefits, support personnel, equipment, and other expenses necessary to support that scientist on an annual basis. The usefulness of the scientist-year as a measure results from the fact that it represents a unit that does not directly reflect monetary inflation and therefore provides ready comparability over time and among subject areas.

The preliminary scientist-year projections for research by subject area provided background information used at the four regional research conferences held in July, 1977, to identify user views. These conferences—in the Northeast at Philadelphia, in the North Central region at Minneapolis, in the Western region at San Francisco, and in the Southern region at New Orleans—identified 2,013 problems. These problems were rated by the 262 delegates and 135 participants representing forestry research user groups.

Each region has subsequently asked scientist task force groups to examine the user-identified problems for their researchability and for scientific opportunities. These reviews have now been completed. It is important to

note that all user problems identified and rated at the regional conferences remain in the system and can be traced to a recommended resolution.

The regional reference documents prepared for and used with the regional conferences are being redrafted, based on the results from user conferences and from the scientist task forces. These revisions will reflect a reconsideration of the draft regional forestry research plan, with projections in scientist-years adjusted accordingly.

This past summer, the Renewable Natural Resources Foundation, at the request of the National Steering Committee, convened a distinguished panel of scientists, science administrators, and educators for a 3-day meeting to discuss how to achieve better results from the research undertaken with respect to forests and associated rangelands. The subsequent report of that meeting (*A Review of Forests and Rangeland Research Policies in the United States* and frequently referred to as the "Airlie House Report") will serve as a basis for discussion and response at this National Conference as well as elsewhere by interested and affected parties. Nineteen recommendations emerged in this report and will be presented and discussed in some detail.

During the first 2 days of this Conference, you have been provided with the opportunity, from the user's viewpoint, to identify and rate problems of national scope and needing research attention in the decade ahead. A total of 454 problems have been identified in this process:

Work Group I: MultiResource Inventory,
Appraisal, and Evaluation
- 47

Work Group II: Timber Management - 70
Work Group III: Forest Protection - 49
Work Group IV: Harvesting, Processing,
and Marketing of Wood
Products - 86
Work Group V: Forest Watersheds, Soils
and Pollution - 49
Work Group VI: Forest Range, Wildlife,
and Fisheries Habitat De-
velopment - 71
Work Group VII: Forest Recreation and
Environmental Values -
82

Our next step following this Conference is to channel your views back to our forestry research planning groups at both the regional and national levels. We will meet tomorrow to finalize our schedule of activities to meet the necessary deadlines for the national program. By August of this year, we expect to have finalized regional and national research planning documents printed and distributed.

This effort to date has formally opened forestry research program content formulation, evaluation, and priority-setting to a broader and more thorough consideration than has previously been the case. Scientists, research administrators, and research users have methodically joined in this unique and worthwhile endeavor. For our part, periodic revisions with continued reliance on user view are considered as essential to a viable and significant National Program of Research for Forests and Associated Rangelands.



Section III

MAJOR NEW INITIATIVES IN FORESTRY RESOURCES RESEARCH



PRESIDING: Dr. Robert E. Buckman, Co-Chairman, National Steering Committee; and Deputy Chief for Research, USDA, Forest Service, Washington, D.C.

This morning's program is intended to carry our deliberations a step further in that complex calculus that has to do with the shaping and forming of a program of research. This past summer you helped us to state problems in your terms, to give us some sense of the importance you attach to them.

The speakers with us this morning represent groups of interests or special studies that surround forestry research, broadly defined to include all of the resources that are associated with the forest and rangelands of this country.

A number of special studies have been done in the last 2 or 3 years by the McIntire-Stennis Advisory Committee, by the National Academy of Science, by Resources for the Future, and by others. In addition to these, some of the professional societies that are interested in the technology of renewable natural resources had a continuing dialog with us. The next four speakers on the program will represent the interests I have just mentioned.

COOPERATIVE FORESTRY RESEARCH ADVISORY COMMITTEE'S VIEW OF FOREST RESOURCES RESEARCH . . .



Dr. Casey E. Westell, Jr., Director, Industrial Ecology, TENNECO, Inc., Houston, Texas. Prior to 1971, held several positions from Research Forester to Director of Industrial Ecology, Packaging Corporation of America

The McIntire-Stennis Act is authorization for the Secretary to encourage and assist the several States in carrying out programs of forestry research that will not only add to our fund of knowledge but also train and develop professional managers and scientists.

So often and in so many fields—oil, gas, chemicals—we have legislation and we labor for years on finding out or trying to determine what was the intent of Congress. There are great arguments and litigation. But we have never had that trouble with McIntire-Stennis because of the leadership telling us what the intent was and even having Mr. McIntire and Senator Stennis tell us directly what their intent was. We never had any bother about what should be done or how it should be done. We had good advice. Even to this day, Senator Stennis is only a telephone call away and frequently advises us on an unsolicited basis. This has been healthy.

There are some unique aspects to the Act. One is the Advisory Board, made up of deans and heads of forestry at various schools and elected on a regional basis; another is the Advisory Committee made up of 14 members—half from the forest industry; half from State and Federal agencies. Its members come from all sections of the country.

A main concern of the Advisory Committee is that the university forestry research in the cooperative program is focused on the problems of importance and that it is an adequate program.

The focus on this National Conference is on that same concern. Members of the Advisory Committee have given much time and thought to the question of research priorities; indeed, we talk about priorities at every meeting. Therefore, we have great interest in the results of this Conference and wholeheartedly support this effort.

The Advisory Committee has the responsibility for keeping abreast of research developments in forestry. Annual meetings are usually held on a campus of one of the cooperating institutions. The universities have opened their doors to us and we are working with them directly. A highlight of the meeting is a review of research of the host school. Naturally they like to talk about strengths and accomplishments, but they also reveal problems showing research weaknesses and inadequacies. Research planning at the individual university level is needed to give proper attention to the local problems as they become apparent from repeated reviews and contacts with the consumers of research results—industry, govern-

ment, other researchers, and the public.

Current national and regional forestry research problems are analyzed as a basis for recommendations in light of the needs for scientific and technical information. The Advisory Committee, with members representing a broad range of forestry and natural resources interests, has excellent rapport with related public agencies as well as with the universities. Also, each member reports to and consults with, a large number of organizations and groups. For example, during the course of the year, I come in contact with at least 100 or so executives in the forest industry. At every opportunity I try to report to them. Also, for example, the Board of Directors of American Pulpwood Association meets at least once a year and I speak at least at one Board meeting as to the progress of the McIntire-Stennis work, and frequently mail other information. Indeed, in some areas I am known as "that McIntire-Stennis guy" because I always get up and report to every group that I come into contact with on a formal or informal basis. I guess this is all right.

Thus, the Committee can respond to its mandate of advising the Secretary on the status of forestry research and the requirements for maintaining an adequate program. Reporting directly to the Secretary is done both formally by letter and frequently in person by an ad hoc committee of two or three individuals.

The McIntire-Stennis Act was passed 15 years ago in October, 1962. Funds were made available first in FY 1964 at the very low level of \$1 million. Since that time, McIntire-Stennis appropriations have been increased, but slowly. The present level of \$9.5 million is much below the amount needed. The law limits the upper level of funding to 50 percent of the appropriated amount for research by the Forest Service. In other words, we are a long way from our current potential funding of \$50 million annually.

McIntire-Stennis funds are used in 61 cooperating forestry schools where the non-Federal forestry research expenditures are now more than \$25 million annually. Total expenditures are more than \$42 million. This non-Federal component grew rapidly with the stimulation and encouragement from the Federal action. In the first 5 years of the program many new faculty members were hired. New facilities were added by 28 institutions.

Another significant development was the increase in the application of fundamental scientific disciplines to academic forestry; too many forestry schools were taught like high

schools. This gave the institutions a capability for further development of research supported by industry and foundations.

McIntire-Stennis funds stimulated development of an essential element of university research—the graduate training program. The Act contains direct, specific authorization for involvement of graduate students in forestry research. More than 600 graduate students currently receive McIntire-Stennis funding support in conjunction with their work with faculty scientists. This has had great importance in facilitating research by faculty members and training of researchers who were needed for program growth. Employment of graduate students on McIntire-Stennis research continues to be important. Future needs for researchers are great. As I understand it, RPA goals in terms of research cannot be met with current facilities for training forest scientists. In other words, a lot more scientists will have to be turned out by the universities if we intend to meet RPA goals.

The Cooperative Forestry Research Program provides for management and planning. There is genuine cooperation among the institutions. Exchange of information through regular meetings on a regional and national basis, in addition to the Current Research Information System (CRIS), provides the basis for joint projects and avoidance of duplication of effort. The Cooperative State Research Service (CSRS) maintains the information system that contains all research projects of the State institutions and the Forest Service. The Service (CSRS) also conducts regular reviews of research at individual institutions for management and planning. The review process involves scientists from other institutions, Federal agencies and industry. The reviewers join in writing a comprehensive report to the Forestry Research Administration, including specific recommendations for program improvement. It is no secret that the Committee follows these visitations closely and reviews and supports the results and decisions regularly.

During 1976, the Advisory Committee of McIntire-Stennis prepared a white paper entitled *National Program for Cooperative Forestry Research*. It was distributed to the universities and other institutions by Assistant Secretary of Agriculture Robert W. Long during December, 1976.

A number of forestry research areas were of such current importance as to merit singling out for intensified or new research effort. The following list includes those research areas considered likely to yield the greatest returns:

1. Conversion of wood wastes into useful products and sources of energy
2. Pest and wildlife management
3. High-yield wood production from plantations
4. Natural resource data technology
5. Soil - plant - water - nutrient relationships
6. Improvement of management on nonindustrial private forests
7. Recycling waste materials on forest land
8. Reclamation of surface mined lands

Additionally, the following recommendations were made by the Advisory Committee in the same document:

1. Fully coordinate McIntire-Stennis programs with other university forestry research, State and Federal agencies, and industry programs. The objective is to discontinue ineffective programs—if any—avoid unnecessary duplication, and place emphasis where it will generate the best returns for funds invested *in terms of the total national goals and problems*.
2. Assure proper transfer of technology to the ultimate user—the forest owners or operator, whether public or private.
3. Increase the level of funding of the McIntire-Stennis program at a rate which will reach the statutory limit in a 10-year period.
4. Place priority, and update these priorities, on all forestry research *in the general areas* as listed in the previous paragraph.

University forestry research administrators and scientists, together with Forest Service counterparts, have taken an impressive lead in

cooperative planning at another level. You are involved in that process here, a part of regional and national planning on a continuing basis. All of these approaches to management and planning that the cooperating universities are using combine to make theirs a unique management system. Other advances in management can be made. Our Advisory Committee is ready to help in any way.

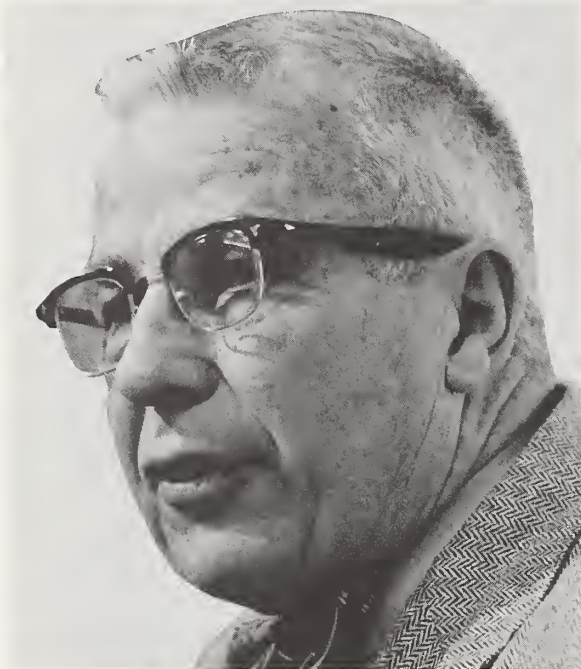
So in summary, I would like to say that I am impressed with the McIntire-Stennis program and have been since its inception. I think the key in this has been the responsibility for accountability given to the Advisory Committee and the Advisory Board.

We almost revel in the scrutiny we get from all quarters. I think this is an important part. It is one of the best examples of citizen participation in forest research law and regulation. Indeed, on at least two occasions, I testified in Congress on totally unrelated bills because they wanted to know about the effectiveness of such an advisory structure.

The interaction and interface between CSRS, USDA, the universities, and citizens has been productive and healthy in my view. This, I guess, would not mean a lot to you except I might say I am at all times conservative and it is hard to get up and really lavish praise on most Federal actions. But it is true and I am glad to be numbered in this.

Too often in my work—not only in forestry but certainly in other areas, too—I work on advisory committees, boards, and the like. Most of the time they are ineffective and often totally ignored. To say the least, it becomes discouraging. Clearly that has not been the case with McIntire-Stennis.

NATIONAL ACADEMY OF SCIENCE COMMISSION ON RENEWABLE RESOURCES AS INDUSTRIAL MATERIALS . . .



Dr. James Bethel, Dean, College of Forest Resources, University of Washington, Seattle, Washington. Former staff member at Pennsylvania State University, Virginia Polytechnic Institute, North Carolina State University, and the National Science Foundation

The study of renewable industrial materials conducted by the National Academy of Sciences for the Office of the Science Advisor to the President produced a series of six panel and committee reports dealing with the potential of all renewable materials for meeting the Nation's future requirements for industrial materials and for responding to a growing crisis in energy supply. The definitive report that emerged from these studies has come to be known as the CORRIM report (Committee on Renewable Resources for Industrial Materials, 1976. *Reference Materials System: A Source for Renewable Materials Assessment*, National Academy of Sciences, Washington, D.C.).

Whereas the renewable industrial materials study included evaluation of the potential of agriculture-based materials, since more than 95 percent of renewable industrial materials are forest-based, much of the effort of the 60 industry, government, and university scientists participating in the study was directed toward an examination of the potential of forests and their products.

Most people interested in this subject have acquainted themselves with the general CORRIM report and I will not take the time to review it in detail. Rather, I propose to discuss

some of the concerns and conclusions that emerged from the study that seem to me to be relevant to the research issues being addressed by this Conference.

A. Information Base

CORRIM had to depend upon the *Timber Outlook* (*The Outlook for Timber in the United States*, published 1973) for its current resource data base and its assessment of national materials production potential. The Committee found that this information resource was deficient as a basis for answering some of the questions addressed to it.

1. A major assessment problem emerged from the fact that, as summarized and made available to groups such as CORRIM, the survey data confound census of tree biomass with assumptions or probable use. This characteristic of the survey made it difficult for CORRIM to evaluate productivity under a variety of use assumptions, which was one of its assigned tasks.

Parenthetically, CORRIM noted that the practice of merging census with analysis in reporting the forest survey made it difficult to compare repetitive 10-year summaries to evaluate national progress. The Committee rec-

ommended that, in future survey activities, census and analysis be separated in reporting.

2. CORRIM felt that the best available technology in sampling, biometric analysis, and photogrammetry, including remote sensing, was not being used to continually upgrade the quality of the survey, and to increase the frequency of update. It urged that this procedure be followed in future survey activities.

3. Evaluation of growth potential of forest land is still dependent largely on the use of normal yield tables. CORRIM recommended that a major research effort be directed at providing a suitable growth-plot-based procedure for evaluating and classifying forest land productivity.

B. Improvement in Forest Productivity

The nation's commercial forest land falls far short of achieving its production potential as conservatively measured through the mechanisms of normal yield tables and based upon low levels of forest management. Furthermore, the country's commercial forest land is far too heavily dedicated to the production of species and timber quality that is low on the preference scale of the U.S. consumer. This contributes importantly to the anomalous situation of a society that produces more wood than it consumes but is nonetheless a large and growing net importer of wood. Thus wood production, which could make an important positive contribution to solution of the nation's balance of payments problem, is in fact currently part of the problem. CORRIM concluded that a number of major research efforts could enhance the effectiveness of national wood materials productivity. Among these are:

1. Since we are far from approaching the limits of improvement of growth of commercial forests, relatively modest increases in investment in the forest biology underlying site improvement, forest type conversion, regeneration, genetic improvement in growing stock, and intensive cultural practices can be expected to return substantial materials production dividends. Research in this domain should be expanded and vigorously pursued.

2. More intensive tree use—i.e., whole tree use—can at some point result in significant drawdown of the nutrient pool of the site. While CORRIM felt that current "alarmist" views on this matter were unwarranted, it urged that the subject be studied in depth and soon, so that threshold levels could be established and the need for nutrient augmentation recognized and assessed.

3. CORRIM, in its analysis, examined the requirements for process energy associated with conversion of trees to industrial materials. Because of an inadequate information base, it was not able to make a similar assessment of the energy requirements associated with growing timber. It is most important that such assessment be possible: hence, the research essential to such an assessment is of great importance.

C. Materials Production from Forests

As the most important renewable material, wood provides an opportunity to meet the Nation's and the world's major materials needs on a continuing basis. Increased use of wood in substitution for metal and ceramic materials was shown to have very significant energy conservation potential. A modest requirement for process energy in converting trees to structural material, as contrasted with competitive nonrenewable materials, reflects the major contribution of solar energy in the photosynthetic process to material synthesis. Forests represent our best current opportunity to use solar energy in substitution for fossil fuel.

At the fiber and chemical feed-stock level, every petrochemical can be technically replaced by a silvichemical. Wood, perhaps the oldest of man's fuels, has the potential for replacing substantial quantities of fossil fuels. CORRIM estimated that two additional quads of process energy could enter the nation's energy supply stream through use of nonused residues of forestry production operations, based upon 1970 levels of forest management and use efficiency. If forest production could be doubled or tripled—a prospect CORRIM found to be technically feasible—and if substantial fractions of this new biomass were directed toward fuel use, the contribution of wood to U.S. process energy needs could be increased by several orders of magnitude. Unlike most other wood materials, increases in biomass for fuel could be achieved in a relatively short time.

A number of research efforts are required if these materials supply objectives are to be achieved.

1. Research in wood science and technology needs to be vastly increased and the supply of competent scientists in this field quickly expanded. As was the case in the domain of nonrenewable materials, the research and graduate study installations in wood science and technology have been allowed to wither. A number of the historically important university programs in this field

have essentially disappeared, and others have been reduced. The Forest Products Laboratory program of the U.S. Forest Service has declined. CORRIM concluded that the Federal Government should follow the pattern established for nonrenewable materials and support the creation and maintenance of a limited number of university centers of research in renewable materials at institutions with substantial faculty and facility commitments to this field of study. Parallel with this, the Federal Government should immediately expand and strengthen the wood science and technology programs of the Forest Products Laboratory.

2. In the structural materials field, major research efforts ought to be directed toward the development of material-conserving dimensions of solid wood building components, improved yield, and quality control technology during manufacture, better methods to extend service life, the development of particle-based structural components, and modification of outdated building code requirements.

3. In the area of fiber materials, there are critical research needs associated with developing technologies leading to higher pulp yields, and to a better understanding of the mechanisms of material and product failure.

4. Increased research devoted to the development of a satisfactory lignin-based wood adhesive would have significant energy conservation implications.

5. Both in the manufacture of wood-based structural materials and pulp, it is most important to develop less energy-demanding conversion processes for materials production.

6. A major research effort ought to be devoted to developing economical and energy-efficient wood burners for industrial and home use.

D. International Trade in Wood

The U.S. forest-based materials supply system has always operated within the context of a vigorous international trade. CORRIM found that it is in the national interest to evaluate United States' posture with respect to its future role as a supplier of renewable materials to meet its own needs and as a contributor to world supplies.

There is little evidence that the United States could achieve an internally balanced, wood-trade budget in the short run. In fact, it is doubtful that this should be an objective even in the long run. An externally balanced, wood-trade budget is a feasible short-term objective, and a trade-surplus budget is a worthwhile objective in the long run. Achievement of these objectives could contribute significantly to solution of balance of payments problems. Under these circumstances, a significant international forestry program pursued by the Federal Government is an objective to be sought. Such a program ought to include the following components:

1. A continuing research program should be directed toward a continuing evaluation of world trade in wood, including assessment of the institutional restrictions on world wood trade and the commercial implications of such restrictions.

2. Major components of the world wood supply and capacity to grow wood are in the custody of the less developed countries. The way in which these resources are used will be of crucial importance. The United States will compete with some of these renewable materials in the world market. The potential for wood biomass to be used for fuel can be far greater in the less developed countries than in developed countries such as the United States. But any efforts to relieve world pressure upon limited fuel resources that are critically needed by this country is in the national interest. Accordingly, any national renewable resources plan ought to include bilateral programs with heavily forested, less developed countries to assist them in making effective use of their forest-based materials resources, both in their own interest and in the interest of the United States.

Finally, it is quite clear that in the area of renewable materials use, a crucial need in research planning and development is the creation of a system that has built into it the potential for quick response to suddenly emerging national needs.

These comments do not exhaust the recommendations of CORRIM, but they represent those elements of the study that in my judgment are most relevant to the issues being debated at this Conference.

NEEDED MAJOR INITIATIVES IN FOREST RESOURCES RESEARCH AS SEEN BY THE SOCIETY OF AMERICAN FORESTERS . . .



Dr. Keith Arnold, Immediate Past President, SAF; and Assistant Vice-President for Research, University of Texas, Austin, Texas. Former Deputy Chief for Research, U.S. Forest Service; and Dean of School of Natural Resources, University of Michigan

The profession of forestry and its Society of American Foresters are solidly based on the scientific principles of forest management. The importance of science in forestry is illustrated by the Preamble to SAF Forest Policies which states, "Forestry is the science, practice and art of managing and using for human benefit forest lands and the natural resources that occur on and in association with forest lands, including trees, other plants, animals, soil, water, and related air and climate."

Please note that the statement begins, "Forestry is the science . . ." I included the entire statement because the last ". . . other plants, animals, soil, water, and related air and climate" illustrates some of the complexities of forestry and the multidisciplinary needs of forest resources science.

Much of the work of the Society of American Foresters deals with research. It is the principal single publisher of forest research papers through its three publications *The Journal of Forestry*, *Forest Science*, and the *Southern Journal of Applied Forestry*.

The Society, furthermore, is organized to promote, conduct, and apply research. Its Forest Sciences Board coordinates the activities of its 27 Working Groups in which each of the 21,000 members can affiliate and work to

accomplish research, extension, continuing education, or just to exchange information on the science, practice, or art of forestry.

The two first national studies of forestry research were conducted by the Society of American Foresters—in 1926 with the American Forestry Association and in 1955 as its own project. We have observed over the years, and particularly in the last decade, that there is a widening gap between needs for research and the means to do it. Reasons for this increasing disparity are obvious, but let me outline some of them for you:

- On-the-ground multiple-use necessitates that research no longer address single-product management or single issues.
- Environmental concerns which emerged in the 1960's complicated management and policy decisions and multiplied research needs.
- Society's demands for increased productivity of forest lands dictate intensive land management in perpetuity, which in turn requires more basic information on ecology, economics, and environment.
- New laws (i.e., Multiple Use Act, National Environmental Protection Act, Endangered Species Act, Resources Planning

Act, National Forest Management Act) require much more scientific information on forestry if Federal agencies are to live up to their legislative mandates.

The widening gap between research needs and research efforts has been emphasized dramatically by the four regional workshops as they identified problem areas and by the symposium sponsored by the Renewable Natural Resources Foundation. The Society of American Foresters has participated in all of these meetings; it subscribes to the problems identified and concurs in general with the ratings developed yesterday.

I do not believe that I need to repeat the descriptions of high priority problems and their relative importance before this audience. However, there is a long and tortuous path from identification of high priority problems facing forest resources and the actual application of research to their solution in terms of improved practices and policies. In addition to the problem identification, I would like to suggest four major initiatives which can provide the driving force for adequate forest resources research:

1. A large, diverse research program to solve in a timely fashion the increasing number and complexity of forestry-related problems.
2. A basic research effort to supply fundamental knowledge and the scientific tools required for the problem solving described in the first initiative.
3. Improved delivery systems for research findings—in brief, better communication between scientists and practitioners.
4. A strong, cooperative international research program.

The first initiative is practically self-evident from the regional workshops this past year and from the results of this Conference. We have identified and categorized the major problems and their segments. Further, we have developed a sense of priority for those problems most critical. Research planners in universities and in government can design the research strategies required to solve the problems on a realistic time scale.

The second initiative, adequate basic research, is often lost to preoccupation with problems. Yet without a continuing flow of fundamental knowledge, problem solving becomes increasingly costly and finally may be ineffective. There must be a formalized basic research program with continuing funding to

attract and hold from among the best scientists in several key disciplines. Of particular need and concern is the opportunity to increase research effectiveness through centers of excellence. I happen to believe we should consider a "national laboratory" operated by a consortium of universities similar to the National Center for Atmospheric Research in Boulder, Colorado. In few places do we have a significant critical mass of scientists.

The third initiative, improved delivery systems for research findings, is actually the bottom line in any research program. Until research is applied, it is not complete. Communication between scientists and practitioners is a two-way street, with problem identification flowing one way and new information going the other. Actually there is need for research to provide new solutions to this timeless problem. The SAF has not yet taken a position on bills related to this initiative now in the Congress, but it does recognize that there must be greater emphasis on methods and programs for transferring new technology to resource managers.

The fourth initiative, cooperative international research, is just good business. Through Public Law 480 research and through scientific ties made possible by U.S. membership in the International Union of Forest Research Organization (of interest is that it is the oldest international research organization in the world), we know there are many centers of excellence in forest resources research. Joint research projects, exchange of data and biological materials, and visiting assignments for scientists all offer opportunities to lower the cost of effective research. A direct benefit would be the more rapid application of research findings from other countries to our problems. International forest research can help developing countries improve and perpetuate their forest productivity and raise their standard of living. Their fiber and their forest environments will be critical as the world faces up to its "limits to growth."

Following this outline of initiatives there are two activities, critical to research, which require special emphasis. The first is organization. As in the January, 1978, *Journal of Forestry*, I direct your attention to principles of organization and management of science and technology programs in government by Juren Schmandt in *Science*, July 29, 1977. Among these principles were:

—"Mission agencies need strong R and D programs."

—"Mission agencies need their own science policies." (They need agency-specific R and D strategies to meet agency responsibilities within agency environments.)

—"Mission agencies need basic research." (They need to be able to support basic research in their areas of responsibility.)

"With these principles in mind, and from experience gained during many years of research administration in universities as well as in Federal and State Governments, I would conclude that any reorganization which brings natural resource agencies together should provide for a strong, independent research entity closely associated with the action agencies. That research entity should be authorized and funded for a strong in-house program fully coordinated and supported by its equally strong extra-mural program balanced between formula and competitive grants to

universities. The research entity should be authorized to work in other countries and to participate in international cooperative projects."

The second area of emphasis is research legislation now before the Congress. I refer to the Weaver Bill, H.R. 8021, "Forest and Rangeland Renewable Resources Research," and the Humphrey-Stennis bill, S.1620. The Society of American Foresters endorses the general provisions of these bills and believes they are appropriate to guide future public policy on forest research. We recommend that any new forestry research legislation relating to the Forest Service should be incorporated in the Renewable Resources Planning Act of 1974.

Early passage of these or similar bills should be an immediate followup to this Conference, and high on the agenda for each one of us and for the forest resource related organizations we represent.

NEEDED MAJOR INITIATIVES IN FOREST RESOURCES RESEARCH AS SEEN BY RESOURCES FOR THE FUTURE . . .



Dr. Emery N. Castle, Vice-President and Senior Fellow, Resources for the Future. Former Dean of the Graduate School, Oregon State University; and holder of teaching positions at Oregon State, Purdue, and Kansas State universities

Resources for the Future is appreciative of this opportunity to contribute to the dialog about forestry and range research needs. Although such RFF scholars as Marion Clawson and John Krutilla have long contributed to the literature of forest economics and policy, we

have only recently established a formal program in this field under the leadership of Roger Sedjo and with the financial support and cooperation of the U.S. Forest Service, the Weyerhaeuser Company Foundation, the American Forestry Association, and the Socie-

ty of American Foresters. In these remarks I will draw on the thinking of others at RFF, on a research needs symposium we sponsored about a year ago, and on the contributions of our forestry research advisory committee. However, none of these people bears any responsibility for my remarks.

While I represent RFF, RFF has no organizational position on the topic being discussed. I speak only from the vantage point of one who has played a role in organizing and initiating the forestry program at RFF, who has a genuine interest in the topic, and who has done research in resource economics.

I have chosen to use the time available to identify four major influences on forestry in the United States. In my judgment, these four influences so dominate, not only contemporary, but also probable future events, that they serve to establish research needs in forest economics and policy.

While these four influences are not research problems in themselves, many research needs and problems stem from these influences. Some will be identified in the course of describing these four major influences or environmental factors.

While RFF's research orientation is that of economics and policy, the research needs which are identified are by no means solely in economics or even in social science. Management and policy considerations always require knowledge and information that comes from outside social science. I assume that natural science research in the forestry research establishment is of two general kinds, not always mutually exclusive. Some such research will be designed to answer basic disciplinary, subject matter needs. But part will be motivated by a desire to provide information useful in practical decisionmaking situations. Both individuals as well as groups have need for such information. Economic and policy research also needs to be based on accurate and relevant natural science data.

1. Forestry in an International Setting

It is no longer accurate to think of United States forestry as isolated from the remainder of the world. There are many reasons for this. I mention only a few here. Global economic development has greatly increased the demand for fiber, paper, and pulp. The comparative advantage of North America in fiber production will permit us to take advantage of this increased demand, but the extent of this advantage is unclear. International trade occurs in a larger context of trade and development generally. While we are increasing our exports

of agricultural and forest products and other items, we have had to increase our imports of other goods and services, including oil. Thus, our relative price level and balance of payments become important policy targets. But our interest in the export and imports of forest products should not blind us to another kind of international trade—the movement of people across national boundaries to take advantage of one of the principal products of the forests—outdoor recreation. The kinds of research which flow from this major development include:

a. The U.S. Role in World Markets

Although the United States generally has had an overall trade deficit in forest products, the vast majority of U.S. forest imports are from Canada, while North America as a whole has had a large trade surplus in forest products. What are the existing and potential roles relationships of the United States and Canada with respect to production and trade in forest products within North America? What is the role and potential of North American forest production in meeting the projected increases in worldwide demand for forest products? What are the potentials for increased forest product production from traditional non-North American sources; e.g., Scandinavia, USSR, and also new sources; e.g., tropical softwood plantations, and how might this impact upon North American international forest products flows?

b. U.S. Comparative Advantage in Forest Products

The usual analysis suggests that a country's comparative advantage is reflected, in the absence of restrictions, by the commodities which it exports and imports. This type of analysis also suggests that the mix of commodities traded reflects the underlying relative resource and productive factor endowments of the economy. However, the application of this analysis to identify and predict which particular commodities will be exported and which will be imported has proved to be difficult but is exceedingly important.

c. Log Exports

Perhaps the most controversial issue in U.S. international trade in forest products deals with log exports from the Pacific Northwest to East Asia. Although some work has been done on this issue, it is not wholly adequate.

What is required is an analysis examining the issue in terms of broad efficiency criteria, with additional examination of the impacts on the various affected groups. Much of the analysis to date has been of a too narrow, short-

run nature and has focused on limited economic impacts.

2. Changing Expectations of the Role of Public Lands

As this audience is well aware, a major shift has occurred in the attitude of Congress regarding public lands. It is the intent of Congress that these lands be managed to provide the full range of products and services they are capable of yielding which have use in our society. The public agencies with responsibility for these lands must now assume a truly mammoth managerial responsibility.

An adequate methodology does not exist which will permit this responsibility to be discharged. The problem is made especially difficult by three considerations:

a. The jointness in production of the products and services yielded by the forests. While this has long been known and actually measured for many locations, it is difficult to handle in planning and management. We do not know a great deal about how these combinations can be varied under different systems of management and with varying geographic areas, because different degrees of independence and interdependence exist.

b. The complexity of valuation processes. For some forest products, established markets exist; in other instances they do not. We much need research that will permit us to place these products on a commensurate basis. Significant strides have been made in this field in recent years, but the journey is far from complete.

c. The integration of local, regional, and national planning. As complicated as it might be to prepare multiple use plans on a local or even a regional basis, it will not be possible to limit plans and management in this way. On both the demand and supply side, local and national markets are linked. This kind of coordination is provided in a market economy by constantly changing prices and the movement of people and goods. When markets do not exist or when a major part of the market is controlled by the action of a public agency, mechanisms are needed to evaluate the consequences of different possible public decisions prior to these decisions being made.

3. The Interrelation of Public and Private Forest and Associated Rangelands

The three major ownership classes of forests and associated rangelands give rise to many interesting public policy options. If we consider the nonindustrial private forests poli-

cy options, we need to make assumptions about what will occur on both the public and industrial forests, because the typical justification for public policy is to better meet national needs. The question should be posed as to whether a given public policy, as applied to the nonindustrial private forests, will make a greater contribution to need than (say) intensifying management on the publicly owned lands. Events of the past decade demonstrate that the real policy issues involve how public and private rights are adjusted and combined with the passage of time. It has also been clearly demonstrated that society has developed many techniques for adjusting this combination of public and private rights.

The following kinds of research are suggested by these interrelationships:

a. Continuous appraisal of national needs for the products and services of the forests and associated rangelands. How can the supply of these be influenced by different policies on the private lands as well as on the public lands?

b. What are the supply effects, and who suffers the adverse and who enjoys the beneficial effects, of indirect policies of shifting property rights between the public and the private sector? Examples of such policies are environmental regulation, taxation, and land use planning and control.

4. Forestry in an Unstable Economy

As a relative newcomer to the forestry field, I hesitate to draw extensively on my own judgment and analysis. Yet I believe a condition exists which is not well understood and which greatly influences the structure and the performance of the forest industry. While the industry has adjusted to the condition, it is not clear what the social costs and benefits are of the policies which are currently being followed.

I have reference to the equilibrating role of housing and lumber production in our economic system. The industry has long played this role in the economy, but the problem has become more serious since the mid-1960's because of the increased impact of inflation, often of a double-digit magnitude. We do not know how to control inflation very well domestically, in part because it often stems from international conditions. Since the mid-1960's we have frequently turned to monetary policy as a means of inflation control.

It is one of the great myths that, because monetary manipulation is an indirect policy, as contrasted to a direct policy such as wage

and/or price controls, that it influences everyone in an equal fashion. Its regional and industry impact is far from equal as this audience well knows.

Although careful studies are not available to document the hypothesis, it seems reasonable to expect (a) that there is substantial inefficiency both in the forest industry as well as in housing because of this instability, and (b) that it causes disproportionate economic hardship. Exceedingly high unemployment rates in various parts of the construction industry as well as in logging areas when money is tight are suggestive of this.

But why is it important to study the problem now? After all, the condition has persisted for decades and the industry probably has made adjustments to this instability and internalized many of the costs which then get passed on to the consumers of forest products.

There are two reasons for current research in the area. In the first place, the industry impact should be made known to those who have responsibility for formulating macro-economic policies in this country. If significant welfare losses occur, either within the

industry because of costs which cannot be passed on, or to the consumers of forest products because of costs which are passed on, these should be made explicit and recognized.

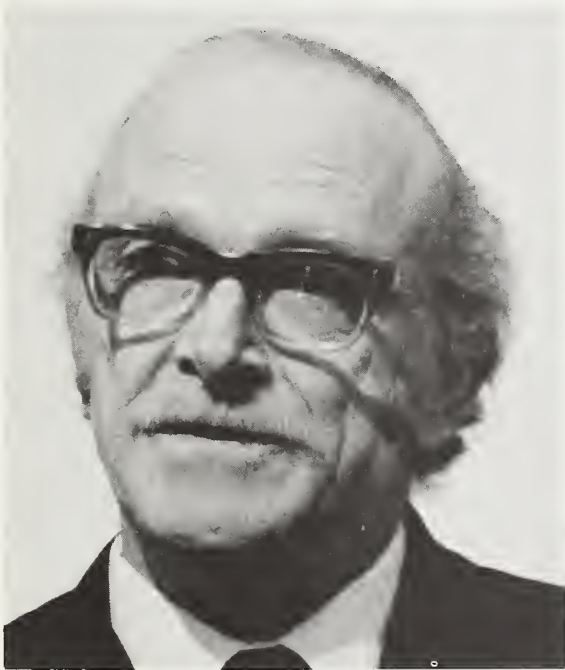
Yet there is another reason why such research would be timely. There may be some fundamental changes occurring in the housing market in this country. If there is, it could affect one of the principal outputs of our forests-lumber products. Housing costs are increasing more rapidly than per capita income. House and home ownership may become increasingly difficult for those with low or lower middle incomes. If this should be occurring, it behooves the industry to understand it and either anticipate appropriate adjustment, or to influence public policy to prevent or ameliorate the impact.

Resources for the Future has research underway on problems stemming from the first three of these four major constellations of influence. Yet our program is a very small one relative to need. We will be happy to join others in analyzing these very difficult problems in a systematic way.



Section IV

NEEDED FOREST RESOURCES RESEARCH AS SEEN BY FOREST INDUSTRY, CONSERVATION GROUPS, AND PUBLIC POLICYMAKERS



PRESIDING: Dr. John D. Sullivan, Co-chairman, National Steering Committee; and Deputy Administrator, Natural Resources and Special Programs, Cooperative State Research Service, USDA

The next three speakers have the formidable task of looking into the future needs of forest resources research. The backgrounds and perspectives they present come from private industry, the conservation community, and the academic community. John Stephens is responsible for the world's largest private forest land ownership—some 7½ million acres in the U.S. and 1.3 million acres in Canada. He also has general management responsibility for manufacturing and for marketing of wood products worldwide. Tom Kimball has dealt with important conservation issues and problems at the state, regional, national, and international levels. He has been a formal advisor to every major department of the executive branch of the Federal government concerned with conservation matters. Dr. Henry Vaux has over 30 years of background in academic forestry. He has been involved with three major study teams under auspices of the National Academy of Science and was a member of the USDA Task Force for long-range forestry research in the mid-60's.

NEEDED FOREST RESOURCES RESEARCH AS SEEN BY FOREST INDUSTRY . . .



Mr. John J. Stephens, Vice-President and Group Executive, Wood Products and Resource Group, International Paper Company, New York City. Former Financial, Operating, and Engineering Positions with Kleinert's, Inc.; Arthur Anderson & Co.; and United States Steel Corporation

Today the U.S. forest products industry is the only basic American industry that remains cost-competitive on a world basis. This position is primarily due to the relatively low-cost timber resources of our Nation.

Maintaining this low-cost producer status will involve a significant increase in the productivity rates of our timberlands.

Thus far this Conference has primarily directed its attention to multiple-use forest management. So much is being done in the basic forest research areas that I fear the implementation will be impossible because of the high levels of long-term low-return capital required. For this reason, I will examine priority problems, as I see them, only in areas of processes and products.

My ranking of priorities may differ from yours because of different orientation. However, both our priorities are significant in better use of our Nation's timber and capital resources.

Wood fiber, being renewable material, offers a greater potential for longer term planning, when we consider the diminishing reserves which face us with some other materials, and the growing demands of more affluent populations for new and diverse consumer products.

Certain problem areas stand out. I will discuss them in a moment, but to put them in perspective, it is important to first assess

America's current forestry cycle . . . what the nature of the forest resource is today.

On our Nation's 2.3 billion acres of land, 753 million acres are forest lands. Some 500 million acres—two-thirds of the total forest base—are classified as commercial forest lands, or lands capable of producing industrial crops of wood and not withdrawn by State or administrative regulations.

One-fourth of these commercial forest lands are located in the West. On these forests, old-growth timber is declining rapidly—and availability is declining until the year 2020, when second growth forests will reach harvestable age and volume will gain.

The West is the Nation's major producer of softwood sawtimber. If the region's harvested lands are not all replanted, we likely face a serious sawtimber shortage early in the next century.

Also, many forests in the South and the Northeast are not well suited for providing softwood-based products. Forty percent of southern timberlands, and 80 percent of the northeast timberlands, are in hardwood species, most of which have limited economic value.

To create an ideal forest, to make what is there more valuable, involves harvesting and replanting softwood in areas where the potential for softwood is appropriate, and directing

other areas toward higher grade hardwood.

Essentially forest production shares the same basic objective as forestry research. That is to achieve the best possible use of the resources that are available. Specifically this involves using the land resource in the most efficient way to meet the increasing demand for wood, which we expect to nearly double by the year 2000.

This implies releasing capital for productive uses, for intensive management to increase the yields, and for comprehensive reforestation on those lands capable of providing the fiber necessary to meet these demands.

All this brings us to a pressing need to release the large amounts of capital which are today reserved for pollution control so that they are directed instead to more productive ends. If fundamental changes could be made in our pulping and bleaching chemistry so that environmentally offensive substances are not employed or produced in the first place, then the capital now earmarked for facilities and equipment to remove these offensive substances from air and water effluents could be released for comprehensive reforestation, for intensive management on industrial lands, for modernization of facilities, and to create more jobs.

Plus, improved pulping systems could provide a better opportunity for using the fiber resource, because pulping potentially can use wood which cannot be used for other purposes.

Large amounts of capital have been spent, and larger amounts still need to be spent, by International Paper Company and by the entire pulp and paper industry for the minimization of adverse environmental effects from our manufacturing operations.

Since 1965, through 1977, the entire U.S. pulp and paper industry spent about \$3.9 billion for protecting environmental quality. We estimate an additional capital cost of \$5 billion to meet the 1984 standards—all this without adding a single ton of productive capacity. The additional annual operating costs for this environmental protection equipment are estimated to be 10 to 15 percent of the equipment's capital cost.

We know that present pulp and paper mill operations produce pollutants; and that some of these materials do leave the plant, even though most mills in this industry already have primary and secondary aqueous effluent treatment facilities. Primary treatment removes settleable solids. Secondary treatment exposes the aqueous effluent to large volumes of air to reduce the biological oxygen demand of

the effluent to a low level, thereby not placing a high dissolved oxygen demand on the receiving stream.

The primary water-borne pollutants are biochemical oxygen demand (BDO), total suspended solids, and color. We know where these are generated. In a typical bleached kraft pulp/paper mill, 82 percent of BOD, 58 percent total suspended solids, and 93 percent color originate in the pulping, bleaching, and chemical recovery cycles.

The objectionable air emissions from a kraft mill are primarily particulates and odorous sulfur compounds. Sodium sulfide is one of the active wood digestion chemicals in the kraft pulping process. A significant portion of the sulfur-containing compounds in the air emissions comes from the pulp mill and from the related digestion chemical recovery system.

We are looking at sulphur-free modifications to control the sulphur-based air pollutants. Aqueous effluents from the digestion and washing operations can be contained mechanically and recycled. However, the aqueous effluents from pulp bleaching are still a problem. Chlorine is the basic bleaching chemical in most bleached pulp mills. Chlorine-bearing effluents generally cannot be recycled and contained within the plant. We are investigating chlorine-free bleaching technologies to reduce or eliminate these levels of chlorine.

Another approach of reducing the pollutants from chemical pulping is to use high yield, less polluting, mechanical pulps whenever we can. Mechanical pulp has been made for many years by grinding wood against a large abrasive stone. Such pulp has low strength compared with chemical pulps, and can be used only in limited applications such as newsprint and magazine papers.

Thermomechanical pulping (TMP) is stronger than stone groundwood, and can be made from chipped wood wastes. We have also developed a chemically assisted mechanical pulping process. In paper grades made with mixtures of mechanical pulp and chemical pulp, use of the higher strength TMP can allow the percentage of the chemical pulp to be reduced, yielding fewer total pollutants per ton of finished paper.

International Paper's research organization has developed a new chemically-assisted mechanical pulping process which produces pulp significantly stronger than TMP and at an equivalent yield level. Chipped wood wastes can be used in this process, also. A commercial plant is in construction now in Canada,

with a scheduled startup late this year. Our new process, while not being pollution-free, will give a marked pollution reduction since it will allow Canadian newsprint to be made without sulfite pulp.

In order to make available the enormous amount of capital now being used for environmental correction, every company in the industry and public research areas should be concentrating on developing nonpolluting pulping systems. This is our first-priority problem—solving it would release capital for productive uses.

The next priority is the development of processes that substitute hardwood fiber for softwood at an equal economic benefit. Pressures on softwood inventories are leading to increased reliance on the use of hardwoods for pulp and paper products. However, hardwoods are severely underused, mainly because of some real cost and technological problems in harvesting and manufacturing.

For example, linerboard is the single largest tonnage paper product produced in the United States—about 16 million tons in 1976. Various companies use from 5 to 50 percent hardwood in their linerboard. Research efforts can increase this percentage without sacrificing product quality, and thereby extend the raw-material base.

At the same time, demand for railroad ties, pallet stock, and furniture lumber will require increasingly larger hardwood harvests. The problem in using hardwood is that many species are undesirable and have virtually no economic use.

But most important, using the hardwood resource as a substitute for softwood at the same economic level for pulping, fiberboard, and lumber will add more value to our forest resources.

The second priority, then, is improved economic use of the surplus hardwood resource available in our Nation—to extend the raw material supply and to help economically convert the lands, where appropriate, to softwood production.

Continued priority research is needed for use of the forest resource as a source of energy. Although the primary pulp and paper industry is energy-intensive, second only to the aluminum industry, we are in a unique position compared with other industries and are well along the way in achieving energy self-sufficiency.

Traditionally, the pulp and paper industry has cushioned its energy intensity through employment of wood residuals such as bark, sawdust, shavings, and dissolved organics

extracted during the chemical pulping as fuel. In 1972, prior to the oil embargo, and prior to full awareness of our energy crisis, 36 percent of the total fuel requirements came from these wood residuals. Mills integrated with wood-converting operations, and mills integrated with chemical pulping, secured a larger percentage of their fuel requirements from wood.

However, wood is not an ideal fuel when compared with the relative energy values of alternative fuels. Dry wood, for example, has little more than one-third the energy value of natural gas. But wood has advantages relative to other fuels. Wood has little or moderate effect on the environment because of low ash, sulphur, and low-bound-nitrogen content; and it also is a renewable resource.

Steps are being taken to further enhance the value of wood fuel and reduce transport cost through drying and pelletizing raw wood. Costs of this conditioning treatment must be justified in terms of value added. Experience in this technology is limited.

Following the oil embargo and rapid escalation of fuel prices, the pulp and paper industry re-examined the availability of wood residuals and the opportunity to expand their use as a fuel. Steps were taken to fill existing wood burning capacity. New wood burning boilers were added. Mills began to reach out beyond the usual perimeters for waste fuel wood as we had done earlier by expanding the primary wood supply with sawmill chips.

In 1976, wood as a percentage of total fuel had grown from 36 to 39 percent, with an overall savings equivalent of 110 million barrels of oil annually.

Future sources of wood fuel for pulp and paper will come from three sources: wastes from wood products conversion, logging slash, and unmerchantable species, including certain hardwoods left standing in the forest.

The analysis here suggests that in terms of demand and present use, there remains substantial opportunity to expand substitution of wood fuel for the oil and gas now being used.

Recovery of logging slash and unmerchantable species is marginal today, and improved mechanical harvesting and collection systems are needed. By coupling fuel substitution with energy conservation, and despite diversion of some residuals into primary products and other alternative displacement, the pulp and paper industry will secure a growing percentage of its fuel requirements from wood—ultimately reaching the 55 to 60 percent level and saving an additional 60 million barrels of oil.

I conclude, therefore, that a high priority for

research must be the harvesting and accumulation systems for the use of wood as a source of energy. This represents a significant opportunity for the industry and a challenge for us all.

Another priority for research is the need to develop engineering design values for lumber based on more reliable machine grading rather than visual-grading rules. Tests of certain lumber grades and species show that design values assigned to softwood lumber through application of existing standards and grading procedures generally understate the strength and stiffness characteristics of the products.

It is the consensus of the lumber industry, user groups, specifiers, and the Forest Service's Forest Products Laboratory that wood-frame structures have been and are providing an excellent record of safe and satisfactory performance. This excellent performance record leads to a conclusion that lumber performs differently in use than tests of individual pieces would indicate. In an effort to explain this apparent contradiction and to obtain performance data, the major lumber-grading agencies in the United States, with the cooperation of the Forest Products Laboratory, are embarking upon a comprehensive field survey of lumber strength properties.

Preliminary testing on lumber systems has demonstrated that interactions between members and connections and the contribution of cladding materials are factors that provide an undetermined additional strength and rigidity to wood-frame construction. It is imperative, therefore, as new lumber strength properties are developed, that a concerted research program be undertaken to identify and quantify all relevant factors that contribute to the actual performance of lumber in service. If increased efficient use and economy of structural lumber are desired, these

factors must be incorporated in new design procedures acceptable to regulatory agencies.

The view of our industry is that the appropriate place for this research is the Forest Products Laboratory in Madison, Wisconsin. Preliminary research is already underway, and adjustments to the FPL program have been made to concentrate on this area.

It is, however, apparent that an additional research expenditure will be required to carry out the lumber, engineering, and frame research program over the next several years at the required level.

The last priority for research is the need to develop resource information in the micro sense. This is important because we need to have inclusive data on the resource as well as ownerships. This would improve decision-making capabilities, produce better data on areas needing reforestation, clarify areas of under-use, and would facilitate the availability of major research information.

These, then, are the high-priority research problems for processes and products that we have identified: nonpolluting pulping process, increased economic hardwood use, forests as an energy source, new design values for lumber, and resource information systems.

Each of these priority problems represents a broad-based opportunity that will benefit not only industrial users, large and small, but the general public and the Nation's consumers. Each of these problems, when solved, will assure an opportunity for the improved use of both timber and capital resources.

If our efforts are successful, we can then have not only increased production but a higher quality forest and living environment. We can increase the capital available for more productive uses and, more importantly, make better productive use of all of this Nation's lands, both private and public.

NEEDED FOREST RESOURCES RESEARCH AS SEEN BY CONSERVATION GROUPS . . .



Mr. Thomas L. Kimball, Executive Vice-President, National Wildlife Federation, Washington, D.C. Former Director, Arizona Game & Fish Department; and Director, Colorado Game & Fish Department

Attempting to speak for other conservation organizations on any subject is generally a risky, if not impossible, undertaking because of the differences in organizational policies, philosophies, and priorities. However, in this instance, it is a pretty safe bet that the National Wildlife Federation shares the concerns of the so-called conservation community.

Although I intend to touch on several points this morning, the main thrust of my remarks is reflected in a recommendation made by the 18 panel members who participated in a 3-day symposium at Airlie, Virginia, May 30th to June 3rd, 1977, to review forest and rangeland research policies in the United States. The panelists made 19 recommendations, the second of which reads: "The historic primary emphasis on timber management research needs to be modified to include greater relative emphasis on environmental/ecological, wildlife, and other aspects of resource use."

In the vernacular of today, the conservation groups say, "Right on!" At this point, I could probably take my seat because I have delivered our main message. But it might be helpful to elaborate on that recommendation. So I will.

Speaking as an interested and concerned "outsider," I would offer these observations about the public and its viewpoint toward

foresters and forestry:

First, the average citizen is more knowledgeable and concerned today than he was at the end of World War II or even a decade ago. He is more aware of the issues involving environmental quality, probably as the result of the upsurge in interest in things environmental. He has an uneasy feeling as he goes about pursuing his recreation that the quality of life as he knows it is slipping away. He has been getting out into more of the remote areas where he can observe forestry practices, and his reactions are not always favorable.

Second, John Q. Public is better informed on how natural ecosystems function.

He's highly aware of needs for a fruitful, sustained timber harvest to ensure that the construction industry remains healthy and vigorous to meet critical needs for wood products. But he also knows that forests, when properly managed, can satisfy many of man's recreational and spiritual needs as well.

He appreciates that the forest environment can meet man's requirements for fulfillment through esthetics, for a variety of outdoor recreational activities, and for protection from floods and droughts. In other words, new demands are being made on all natural resources from an expanding human population enjoying greater amounts of leisure time.

Third, the average citizen is a law-abiding member of society who pays his taxes on time, obeys traffic regulations, and worries more about his family's health than his own. Consequently, he relies on government and big business to do the right things and establish a framework for ethical behavior which protects his children's rightful inheritance to a high-quality environment.

If government officials fail to follow through on what he considers his sacred trust, they stand to lose credibility and support from an important part of the electorate. If big business is lackadaisical about its moral commitment to enhance the general amenities associated with our nation's forestlands, it likely will be investigated by the Congress, castigated in the press, and alienated from many potential customers.

In short, the public looks to responsible government and industry to safeguard our dwindling natural resources. Hence, wise multiple use of commercial forests, as well as those which are publicly owned, must become a living reality and not just hollow words.

One needs only to examine the thrust of national legislation enacted since passage of the Multiple Use, Sustained Yield Act of 1960 to see that the public wants its forests managed in a more balanced manner. Furthermore, it appears that the public is willing and anxious to get more personally involved in the formulation of plans and in the decisionmaking process to insure that its needs are met.

The most recent manifestation of that growing desire and commitment is, of course, the passage of the National Forest Management Act. Perhaps it is an unfair observation on my part, but it seems to me that what the U.S. Congress and the public were saying in passing that legislation was: "Fellows, clean up your act and bring about better balance in the management of the National Forest System or we will do it for you by prescribing a bunch of rigid rules for you to follow."

It is our candid opinion that the forestry profession must come to grips with these public reactions if it is to attain its overall goal of wise resources management. That being the case, it is imperative that future forest resources research become increasingly interdisciplinary in its thrust.

Recognizing that public forests and rangelands—as well as small, private woodlots—can and must serve a wider variety of users in the future, the average citizen will not be content to see his tax dollars funneled into timber management research at the expense of research needed in fish and wildlife habitat

improvement, watershed enhancement, recreation, and other values.

Fortunately, there appears to be a small move in that direction already. However, the shift in research emphasis is too slow and needs to be accelerated. For example, the *National Reference Document* entitled, "National Program of Research for Forests and Associated Rangelands" indicates on page 6 that wildlife and recreation-oriented research like the last two categories shown in the table received 11 percent of the total scientist-years of effort in 1976. By 1985, the percentage will increase to 12.8 percent. However, during that same 10-year period, the percentage of total scientist-years of research effort devoted to timber management and the harvesting, processing, and marketing of wood products as in the second and fourth categories shown in the table holds steady at 46.6.

Meanwhile, forest protection as in the third category in the table not only drops from 20.8 percent to 16.3 percent during the same decade, but it actually will have 5 fewer scientist-years of research effort allocated in 1985 (383 scientist-years) than in 1980 (388 scientist-years). That is the only one of the seven categories of research programs that shows a decrease in scientist-years during either 5-year span from 1975–1980 or 1980–1985.

Page 12 of the reference document indicates that the decrease will occur in two programs: "Control of Insects Affecting Forests" 2 scientist-years and "Prevention and Control of Forest and Range Fires" 3 scientist-years. For the life of me, I do not understand how reduced effort in these program areas can be justified. I think it is safe to predict that the conservation community will oppose such a slowdown, especially in research related to development of variable systems of integrated pest control.

Overall, most conservation groups probably will view the table on page 6 of the reference document with considerable suspicion, if not outright disbelief. They are likely to take the position that the projected research continues to be lopsided and unduly weighted in favor of timber harvesting. The only possible way, as I see it, of getting conservation groups to accept such a disparity in allocation of research resources is to convince them that the research aimed at stimulating growth of timber and production of wood products will be sufficiently broad in scope to give equitable consideration to its impact on fish and wildlife, recreation, environmental quality, and other multiple-use values.

In other words, greater emphasis will be

needed in the future on an eco-system approach to forest and associated-rangelands research. Even then, it is probable that many conservation organizations will insist on more equitable apportioning of the research pie.

In my remaining few minutes, I want to touch on several items and make a few personal observations. From this point on, I must emphasize that I am speaking only for my own organization, although it is likely that my views are shared by at least some other conservation groups.

With regard to basic research—in the long term, there is no substitute for bringing to bear the array of available disciplines in the biological and ecological sciences in a manner that will provide a more thorough understanding of how to manage forests and associated rangelands in the most scientifically-sound manner.

Excellence in basic research will help provide this capability. The first recommendation forthcoming from the Airlie House symposium speaks to that point: "Greater use of all of the scientific capabilities of the colleges and universities is desirable to strengthen the total research effort in forest and range-related fields." Closer adherence to existing statutes should help in this connection.

While our primary concern is the accommodation of fish and wildlife in the national forests, that accommodation has been and will continue to be determined largely by what is being done to meet other objectives. Accordingly, we have a direct interest in the complexion of extractive commodity production, because here is where the destiny of fish and wildlife is being determined. The degree of soil integrity, water quality, and the nature of vegetative manipulation are demonstrably the major determinants.

I might pause here just a moment and reflect back in some of my previous experience when I headed the Wildlife Agency in the State of Colorado. We conducted some experiments there for 15 years on competition on the rangelands between big game and domestic livestock. And the bottom line after 15 years, as I recall it, was that if you properly stock a range with the various classes of stock, the competition is very little.

You are going to have viable populations and surplus production of livestock as well as the various species of wildlife. But if you overuse that forage, the competition then becomes keener and you wind up, the more you overuse it, with the greater the competition between the various classes of stock. So that is why I say that our research effort has to be multidisciplinary in its approach. Whenever

you manipulate plants, whether it be the trees or the shrubs or whatever you do to the soil and so forth, you affect that whole ecosystem.

As a consequence, we have an interest in the kind of research being done in logging engineering, silviculture, forest and range pest and disease problems, soils knowledge, prescribed floral composition, invertebrate fauna, and so on. For example, sky-line logging, while not embraced enthusiastically by all segments of the wood products industry for several reasons, nevertheless offers a method of logging which in site-specific situations can be executed in a manner conducive to the welfare of other values. Because of this, we have an interest in supporting this kind of research.

As a generality, good forestry in its broad context is usually good for fish and wildlife. By the same token, poor forestry or range management is bad for wildlife.

In the final analysis, the general public, and the fish and wildlife interests in particular, judge the competence of public forest land stewardship primarily by three simple yardsticks: soil stability, water quality, and the degree of diversity of indigenous vegetation.

U.S. Forest Service-administered lands are public lands. As such, their stewardship is cloaked with a different set of legal accountabilities than private lands. The spectrum of research accordingly should reflect this broad responsibility. Beyond that as a matter of public policy, the proportion of federal research expenditures allocated to natural resources research needs examination as a device to support expanded forest and rangeland research.

As a footnote to my observations, I have two more comments. First, I have some reservations regarding the strong emphasis reflected throughout the various documents I have seen with respect to institutional involvement. While this may be good, it seems that this is another question to be handled in a different exercise. Research per se is enough to treat, as complex a mission as this is. Second, there is a need, in my judgment, to develop a more effective means of compiling and distributing research information to ensure it is brought to the timely attention of the key decisionmakers.

Hopefully, that will lead to a situation where research, when appropriate, is applied more expeditiously to field operations and not simply left to gather dust on library shelves.

In closing, I would remind you that throughout its lifespan since 1936, the National Wildlife Federation has had a deep, abiding interest in and concern for the proper use and management of forest resources, as well as

wildlife, water, soil, and air. Always the Federation has stood for the sound and professional management of forest resources, for application of the multiple-use concept, for sustained yield management, and for forest control as well as research, reforestation, and all of the other elements in a well-rounded forestry program.

On several occasions, we have joined other conservation groups and segments of the timber industry in testifying before Congress on behalf of increased appropriations for the Forest Service for its broadest mission. We have met with administrators in the Office of

Management and Budget, coming away with bloodied heads but a bit more money from time to time.

We have carried numerous articles on forestry in our various publications in order to try to better educate the public. We do these things because we believe strongly that your mandate furthers the conservation cause. In return, we simply ask that all of you engaged in this work, administrators and researchers alike, do your level best to apply an interdisciplinary approach to your forestry tasks and to work for better balance in forestry multiple-use programs.

NEEDED FOREST RESOURCES RESEARCH AS SEEN BY PUBLIC POLICYMAKERS . . .



Dr. Henry J. Vaux, Chairman, California State Board of Forestry. Former Director, University of California Wildland Research Center; Dean School of Forestry, and Associate Director, Agricultural Experiment Station, University of California

My task is to talk about forestry research as seen by a public policymaker. Currently, I am engaged on a part-time basis in policymaking of a certain kind. Just to give you some perspective on my policymaking viewpoint and experience, I will indicate two of the sorts of issues that I get involved in in work for the State Board of Forestry.

It is basically a regulatory commission. I suppose some of your less charitable colleagues, Mr. Stephens, would suggest that my Board is engaged in putting out of effective competition that last competitive industry in the United States.

I would not accept that charge. Neverthe-

less, it indicates something of the nature of our work. Just to give a little flavor of realism to the very vague term "policymaking," the kinds of policies we make we deal with the following kinds of issues.

Last week at our meeting, we had two issues before us that had to be resolved. One was whether we would issue any timber-harvesting permits to allow private owners to cut timber on their own land in the 48,000 acres in the proposed addition to the Redwood National Park.

Another case involves issuing a timber-harvesting permit to a person who owned only 40 acres of land, in the center of which was a

bald eagle's nest. The bald eagle is protected under the Endangered Species Act. Wildlife biologists told us that the buffer zone necessary to provide adequate protection for those bald eagles was 50 acres.

These are just the sort of minor limited policy decisions that we have to deal with. But minor as they may be, if I read my mail correctly, they have considerable impact on people. The people have considerable impact on politics, and so I strongly suspect that we do have something to do with public policy.

Now, I mention these experiences and refer you to Mr. Sullivan's statements about my brief work in research planning because I think you should have them as background for accepting, as I hope you will, my first comment on this assigned topic, "Needed Forest Resources Research as Seen by Public Policymakers."

My response to the implied question is that public policymakers see very little need whatsoever for forestry research *per se*. Now, before the Chairman takes the microphone away from me for making what seems to be such a rude and uncouth remark, totally inappropriate for this occasion, let me explain a little more fully what I mean.

In my State, we have two representative forestry research institutions—the Pacific Southwest Forest and Range Experiment Station, and the California Agricultural Experiment Station at the University. Both are located in the city where I live, and I have many relationships with personnel of both. I actually read perhaps 5 percent of their total research output. Through annual reports and things of that sort, perhaps I have some knowledge and capability to refer to another 10 percent of their output.

I do not believe my performance in that regard is very much worse or very much better than that of most administrators, legislators, or other such deviant types to whom the originators of this program refer as "policymakers." Frankly, one reason for that modest record of learning the new results of research is a shortage of time.

The usual monthly bibliography of research is maybe 50 or 60 items. More importantly, only a small fraction of that research output comes to my attention in the context of making one of these rather narrow policy decisions. Most of the research reading that I do is as a change of pace, frankly, from the study of decisionmaking problems. And the major reason for that, of course, is that the research product is cast in a framework which does not bear directly on resource policy issues.

Now, in contrast to that rather negative view of research needs of the decisionmaker, let me hasten to add that the poor fellow desperately needs, and I think he understands that he needs, a vast amount of information of a very specific kind. He needs a great deal of information that will show the results of adopting the different resource management alternatives between which he must choose.

Second, he needs information that will help translate public policy goals into practical terms of the volumes and timing of specific forest resource outputs and conditions. And third, he needs information on the very real political and economic consequences and constraints that are associated with adoption of each resource-management alternative. Virtually every public policymaker urgently needs all three of these specific kinds of information; and he needs them in a form that can illuminate what will actually happen if he pursues a particular alternative on the ground.

I have looked at the program of this Conference in an effort to see which proposals for forestry research are likely to plug the gap between research output and policymaker's needs for information. At first glance, the *National Program Document* seems to deal quite explicitly with the problems of evaluating resource alternatives and does so at a number of points. But as I have listened to discussions here and at San Francisco, it has dawned on me that there is indeed a sizable gap. It arises because when we talk about evaluative topics—for example, "Developing economic models for determining alternative land use, by site-specific areas," or "Develop methods of predicting consequences of management practices on the hydrologic cycle for a variety of forest ecosystems"—we create a communications gap.

When researchers talk about those topics, I hear them stressing their concerns as largely one of methodology or how to do it. They do not seem to be concerned with the specific onsite application of those particular sorts of problem situations. Yet it is only when the onsite applications have been provided that the research becomes useful to the policymaker.

To an economist, utility is a function of time and of place just as much as it is a function of the inherent properties of the goods. And that is the way it is with research. Much of our research output, despite its recognized intrinsic value, lacks its time and place utility. Even General Motors cannot sell refrigerators to Eskimos.

Time and place utility is an important fea-

ture of research. So the problem is more fundamental than just improving delivery for research. What I think is needed is a new kind of linkage mechanism to help relate research output to the policymaker's problem. For lack of a better known term, I am going to call this missing linkage "Research Coordination of the Third Kind."

To date, research disciplines have done much to coordinate the efforts of individual researchers within each given field. This is coordination of the first kind.

The national research planning effort of the past decade has done much to coordinate work of agencies, forestry schools, and so on—coordination of the second kind. Now we need a strong new initiative to relate the entire research program to the decisionmaking structure, which is research coordination of the third kind.

This problem has been addressed in the past 2 or 3 years by a panel working under the Environmental Research Assessment Committee organized by the National Research Council. That panel was chaired by Dr. Duncan Patton. It was charged with identifying the research and information needs for decision-making dealing with the environmental impacts of resource management. Its report, which bears the title *Environmental Impacts of Resource Management, Research and Development Needs*, was published last month. It is available from the National Research Council.

The panel's principal conclusion can be paraphrased as: None of the analytical techniques available today is comprehensive enough to analyze the consequences of resource management alternatives for the complex economic and social systems we identify as natural resources.

The panel thus asserted an urgent need for an improved capability to develop comprehensive integrated analyses of specific natural resource systems. To put it another way, there is urgent need for better models to assess and evaluate alternative multiple-use potentials, as the Program states. But to do that, satisfactory ways must be found to incorporate the results of research in most of the other areas of the Program—research in forest protection, timber management, watershed management, and so on—into those multiple-use models. Unless such links can be constructed, far too much research output simply cannot be brought to bear on the decisions that affect how resources are used.

There is a second respect in which the program proposals seem to be deficient when I compare them with the needs of policymak-

ers. As I said earlier, that need includes information on the political, social, and economic consequences and constraints that characterize each resource-management alternative.

I suspect that an analysis of the *National Program Document* would show that, of all the verbs in it, the verb "evaluate" leads all the rest in frequency of occurrence. Well, what does "evaluate" mean? We know that public-policy decisions have very real consequences for people. Some, such as the economic effects of land reallocation, we can estimate—at least at the first point of impact. But we really know very little about the social system that generates forest and range policy and, until we do, policymakers are in poor shape to assess the consequences for people and for further policy evolution. Without a knowledge of what those social and political consequences of resource use are likely to be, and how these in turn will affect the future thrusts in policy, the policymaker has to rely not on information but on the seat of his political pants.

We need research on the policymaking system itself. What are the organizations that comprise it? What are their goals? How do they interact? Where is the system as a whole headed?

I see little in the *National Program Document* that suggests such a systems approach to the human side of natural resource management. For this purpose, we need a social science parallel to the ecosystem approach which is now producing a good deal of information that is very useful on the biological side.

Nor have I been encouraged as I have listened to the discussions in the work groups here and in San Francisco. The question, "But is that a researchable topic?" was raised in one group or another at least once every 10 minutes. The *National Program Document* contains statements of problem areas, not statements of researchable topics. So the question of researchability may be proper enough. What has given me concern is the distinct impression that the question about researchability was usually raised by particular kinds of problem statements. They were the kind that made it clear that the core of the problem was social or political in nature.

How often is the statement "It is not a researchable topic" really a reflection that we are not too sure how to approach the subject? The forestry research establishment is not, it seems to me, as well staffed with political and social scientists as it is with biological scientists and economists. This may well be biasing program planning away from some problem

areas where additional information is badly needed.

I do not at all underestimate the difficulty of either conceptualizing or executing the research that is needed on the social dimensions of natural resources. The very deficiencies of information of this kind are a measure of the difficulty. It takes research organizations, par-

ticularly those largely rooted in the natural sciences, into some very treacherous terrain. But unless we find ways to include these dimensions more fully in our research program, the resulting vacuum is almost certain to be filled by others who perhaps may be less capable or less open-minded or even both.



Section V

THE ROLE OF VARIOUS ORGANIZATIONS IN RENEWABLE NATURAL RESOURCES RESEARCH



*PRESIDING: Mr. Hardin R. Glascock, Jr.,
Chairman, Board of Directors, Renewable
Natural Resources Foundation, and Executive
Vice-President and Editor-in-Chief, Society of
American Foresters, Washington, D.C.*

We are very fortunate today to be able to have addresses by some of the distinguished people representing the organizations most concerned with forest and rangeland research. We also will have a panel of distinguished gentlemen responding to their recommendations made at a Forest and Rangelands Research Policy Symposium.

WELCOME TO THE SMITHSONIAN SESSION . . .



Dr. James Nielson, Acting Director of Science and Education Administration, USDA, and Deputy Assistant Secretary of Agriculture. Former Director, Washington State Agricultural Experiment Station; and staff member, Washington State and Michigan State universities

I am pleased on behalf of the Secretary and the entire Department of Agriculture to welcome you to Washington, D.C.

I am impressed by the commonality of major topics of research concerns between forestry and agriculture. The list for agriculture contains most of those also identified by forestry researchers and forestry research administrators.

They include:

1. Environmental quality.
2. Energy conservation.
3. Production costs and product prices.
4. Genetic improvement.
5. Climate-weather/water resources.
6. Land use.
7. Integrated pest management.
8. International trade.

There is no apparent end to the number of forestry problems to be solved. From what I heard last night, the results of your activities the past two days attest to that. We, in USDA, are well aware of some of the key problems. We recognize that a growing population with great mobility has placed sharply increased demands on forest resources for recreational use. Demands for wood products have grown rapidly. Environmental problems, entwined with resource conservation and use, became even more important as multiple uses of forest

resources intensified.

The longer term nature of wood production makes forest management decisions difficult. The very large number and wide variety of ownerships of forest resources further complicate the situation. On top of all this, a group of forest plants and animals is one of the most complex biological communities that we have to manage. Unfortunately, there are limitations on the resources that can be made available to research problems. This is true both in agriculture and in forestry. This means priorities have to be identified, and hard choices made on what research will be done.

In 1975, a National Food Research Conference, held in Kansas City, produced results that have been of great help in planning agricultural research. You are to be congratulated on your initiatives in following that example to do your own research planning for forestry. The results of this National Conference, like the Kansas City Conference, will receive the attention of the Department and its cooperating agencies and institutions. They will be used in development of both Federal and cooperative research programs.

We, in USDA, now are in the process of implementing provisions of Title XIV of the Food and Agriculture Act of 1977. These provisions pertain both to forestry and agriculture. The Act proposes to improve the planning and coordination of research by Federal

agencies and with the States. It is quite specific in reference to research directed toward improving the management and use of the Nation's natural and renewable resources. It also gives special attention to extension programs in forestry and natural resources, with emphasis on improving productivity of small private woodlands.

There has been much concern expressed regarding the transfer of technology from the laboratory to the practitioner. The Food and Agriculture Act contains important provisions designed to get research results put to use.

The Act calls for establishment of new pro-

grams and improvement of existing programs. Department reorganization now underway will enhance our capabilities in research planning, bring existing programs into closer coordination, and make possible the establishment of effective new programs.

Let me congratulate you on this massive national effort to define forestry research needs. And let me assure you that the Department backs your efforts and will be using your final Conference report as a guide to future forestry research directions in programs it has responsibilities for in our cooperative federal-State research partnership system.

WELCOME . . .



Dr. Robert Gluckstern, Chancellor, University of Maryland, representing Dr. W. Glenn Terrell, Jr., President, National Association of State Universities and Land-Grant Colleges

We in the universities are in the unique position of being able to combine the concerns and resources of the Federal and State Governments into a viable program. This joining of Federal resources with State resources for forestry research is one good example of the strength of our State-Federal partnership.

One of the uniquenesses we contribute to the whole process of the development and diffusion of science information is the extension service—both cooperative extension and continuing education. The ultimate payoff from research efforts comes through the adoption of the resulting knowledge, practice, or idea—the new technology that is applied, the facts that are understood and used in decisionmaking, the ideas that are then

weighed and adapted as well as adopted to fit the needs of individuals and groups. This is the job of extension—to see that people who need help have the latest and best information and facts available on which to make decisions and guide their actions. In addition, extension can keep research informed on what is needed in the way of new research—and on what is happening as a result of past research.

So the partnership at the State level between cooperative extension and the experiment stations is vital for forestry, just as it has been and is for agriculture. We must make sure that research in forest resources is matched with an adequate extension program.

We need greater emphasis on dissemination

of new information to reach the very large numbers of potential users. The span of users is great.

We need a system of information and technology transfer that covers the breadth of interests from wood producers to consumers of wood products, outdoor recreation, and other forest and range amenities and services.

Forestry research needs encompass a broad range of problems. Thus a very broad base of institutional research is required. There is also a need for a great amount of fundamental work. Many disciplines beyond the department or school of forestry within the university will undoubtedly have to be called upon to contribute in order to meet the research needs you envision. This would include competencies in departments of plant pathology, entomology, engineering, biometry, and sociology to name but a few. We in the universities must see that the way is properly paved for this kind of cross-disciplinary and interdisciplinary research.

Nor can we overlook the human factor in forest resource use—the citizen interest, for example, in natural-resources conservation and in protection of the environment. These areas need more attention in forestry research as well. Social scientist collaboration with forest scientists would help us get information useful toward solving some of the more serious forest management “people” problems.

In research, there often must be a “critical mass” of interest and resources focused on a need before significant results can be achieved. We who administer universities and Federal agencies, and particularly those in research administration, must consider just where such a critical mass is needed in forestry research and how to bring it about where needed. The depth and breadth of scientific talent on a university campus is great. Yet in some areas crucial to the needs you are identifying in this Conference, a given university, and certainly a given forestry school, may not have the scientific resources to contribute to the solution to a particular need. For this reason, forestry researchers must help build on the depth to be found in other parts of the

university in coping with some of the more difficult forestry problems. Also, we may well need to recognize in the universities just what our limitations are and decide that we will specialize our research in those areas where we have the critical mass and let someone else do research in other areas. These will be difficult decisions, but ones that must be made. To make these decisions most effectively, and with the greatest chance for overall success in attacking major forestry research needs, it is likely that such decisions for specialization should not be made by one institution alone, but that several of us with similar conditions and concerns should get together and among us decide how we can best specialize and share to get the needed research done.

I want to bring one more dimension into this discussion—that of the international area. Our Federal Government has expressed a dedication to helping other nations through our universities through Title XII. Although forestry is not specifically mentioned in that Title, I feel strongly that the traditional coupling of agriculture and forestry that we have had in the land-grant system should be maintained and expressed in the international area. There should be strong forestry participation and greater institutional commitment to this area than there is at present. Forestry problems are not the exclusive province of the United States. They are global. Certainly this was evident from the needs identified during the regional workshops that preceded this National Conference.

As the Airlie House Symposium Report from last June points out, we use much wood from other countries. So we have a substantial stake in forestry practices elsewhere. The world's tropical forests are being destroyed. Pressure on forests generally are great. So the international involvement of forestry scientists, and the importance of such involvement, is clear. We must expand our forestry research horizons beyond our own country.

I am very pleased to be with you even if only briefly this morning, and bring you the greetings of the National Association of State Universities and Land-Grant Colleges.

THE SMITHSONIAN INSTITUTION AND RENEWABLE NATURAL RESOURCES SCIENCE . . .



Dr. David Challinor, Assistant Secretary for Science, the Smithsonian Institution. Former staff member, Yale University; Connecticut Agricultural Experiment Station; Yale Peabody Museum of Natural History; Jonathan Edwards College; First Mortgage Company; and Anderson, Clayton and Company of Houston, Texas

It is particularly appropriate that we are meeting this morning in a very distinguished facility. This auditorium was dedicated to Spencer Baird recently. You will see his bust at the entrance. He, among other things, was interested in fisheries research. Scientists at the Smithsonian, before the turn of the century, did a great deal of inventory work on the fisheries resource and the fish that live along our east coast. In the process of this research, they turned up many species that were extremely valuable commercially. Out of this effort, the Bureau of Commercial Fisheries developed and spun off from the Smithsonian. It then evolved into the National Marine Fisheries Service. Today, there are some 20 scientists from there still working here at the National Museum of Natural History where you are now. In addition, we have scientists from the Department of Agriculture who work with our entomology collections; and we have scientists from the Fish and Wildlife Service working with our collection of birds and mammals.

So the Institution has had this very long history of research in natural resources—not just trees and rangelands, which we are primarily concerned with at this meeting, but in almost all facets of our natural resources.

The Institution has set up, or has in operation, a series of automatic monitoring sta-

tions—monitoring everything from ocean temperature to the ozone content of the upper atmosphere.

The problem with these automatic monitoring stations is how much should you measure, and how long should you measure, before you become overwhelmed with the data you are accumulating.

Let me give you an example. Dr. Abbott, the 5th Secretary, who died 4 years ago at the age of 101, started an experiment in 1906 here on the Mall. In 1906, this was still a relatively undeveloped part of Washington. The Potomac came quite close to the south side of the Red Castle just across the Mall. There was a swamp there. Back of the Castle, he set up some instruments to measure solar radiation in which he was particularly interested. He was concerned with the ultraviolet spectrum and started to monitor solar radiation hitting the ground.

This experiment continued until 1969. What we learned was that the incidence of solar radiation at all of the wave lengths of the spectrum stayed very level until about 1954 or 1955, shortly after World War II, when we started to notice a decline at the ultraviolet end of the spectrum. This continued until 1969 when we shut this experiment down, at which time there had been about a 16 percent decline in the amount of ultraviolet hitting the

ground or the grass there.

You tell this to a Subcommittee, and the answer is "who cares?" Those of us concerned about how plants and trees grow know that the ultraviolet end of the spectrum plays a crucial part in plant and tree growth. It has to do with vitamin synthesis. Of course, we don't have the grass here. So people were not terribly concerned with this 16 percent decline. We attributed this decline to automobile emissions, particularly the ones that filter out some of the ultraviolet. As a result of this research, we set up a whole series of other stations—one in Point Barrow, Alaska, one in Panama, one in Jerusalem, one in Florida, one in Rockville, to see if we could get a global view of what was happening.

After 6 or 7 years, it turns out what really determines the amount of ultraviolet hitting the ground is almost completely local conditions—the degree of cloud cover primarily. Also, because of all of these years of monitoring, we are getting a better idea of just how significant the ozone is. The concern we have is with oxides interfering with ozone formulation that will filter out ultraviolet. We have a long, long way to go, and we are not always sure we are monitoring the correct thing. But we are beginning to get a much better picture.

I stress this one example because the experiment went on so long. And we continue to monitor such things as ultraviolet radiation. In addition to that we also do work, for example, in Panama, where we are trying to understand the tropical forests. The previous speaker mentioned the rate at which the tropical forests are being cut down. This is something that concerns us a great deal. To try to understand some of the consequences of this, we monitored 123 individual trees on Barrow Colorado Island. It is a relatively unstressed monsoonal forest. There were 123 fig trees of two different species. Fig trees are fertilized by very specific species of wasps. It turned out,

over this 2-year period of monitoring these trees—at no time did we ever find there were none of these 123 trees not blossoming. There were always at least three blossoming. It suddenly occurred to some of us should, by accident, these three blossoming trees of the 123 be cut down, the odds would be fairly good that that wasp population might also disappear, because they are obligate fertilizers of fig blossoms. If the wasps were not able to fly to the shore of the mainland, 123 fig trees could become sterile and not reproduce.

These were the sorts of things we are beginning to understand. They are much more complicated than we had any idea of. At the end of some 40 years of research on Barrow Colorado Island, we are just beginning to scratch the surface.

The Institution also operates a very interesting program with the Peace Corps under a contract, and the Peace Corps/Smithsonian program has found a great many foresters for the Peace Corps.

Incidentally, we have worked out a very good system for Peace Corps volunteers to be able to do their field work toward advanced degrees while they are Peace Corps volunteers. We have been able to produce in both wildlife management and forestry some good doctoral dissertations. For anybody who is interested in these details they can call my office.

The Institution operates 2,600 acres of mostly second-growth temperate forest on the Chesapeake Bay. We operate that as a reserve as well as a research facility.

I have outlined very briefly some of these efforts the Institution has taken to try and understand how we best can manage and maintain our own natural resources both with respect to endangered species and endangered plants.

I hope you will all have a chance both to look at this Museum and the other museums.

THE ROLE OF THE DEPARTMENT OF AGRICULTURE, NASULGC, AND ASCUFRO IN RENEWABLE NATURAL RESOURCES RESEARCH . . .



Dr. Orville Bentley, Co-chairman, Agricultural Research Policy Advisory Committee to the Secretary of Agriculture; and Dean, College of Agriculture, University of Illinois, Urbana-Champaign, Illinois. Former staff member South Dakota State University, Ohio State University, and Ohio Agricultural Experiment Station

The public support of research on food, nutrition, agriculture, and forestry and related natural resources has yielded high returns. The consumer has benefited from the outpouring of products from efficient food and fiber industries. The industries themselves have had access to new and innovative scientifically-based technology for development and problem solving. But, as in all endeavors, new challenges arise; and the vitality of research programs depends on their capacity to respond to and meet future needs before the needs become critical problems. For educators, government, and industry, these concerns have been the source of motivation for planning future interdisciplinary and coordinated research in forestry as reflected by the report "National Program of Research for Forests and Associated Rangelands" and for this National Conference on Research Planning for Forests and Associated Rangelands.

The coordinated planning mechanism provides for an interchange of ideas and for the mobilization of expertise from the public and private sectors. The effort is timely. The leaders responsible for planning and conducting this national effort are to be commended for their diligence and dedication.

While there is effective coordination and cooperation in the conduct of publicly-supported research in the United States, there is a continuing need to develop more and better ways to use State and Federal research resources. In some cases, this may lead to improved use of laboratories and field locations; in others, the outcome may be a better identification and a clearer understanding of new program needs. Implicit in a sound cooperative program is the opportunity for scientists to interact and to join in cooperative efforts to solve problems or to undertake more fundamental research—often, we hope, in a multidisciplinary mode.

The joint planning activities can be encouraged by administrative support that has evolved through experience of the past several decades. For example, the National Association of State Universities and Land-Grant Colleges (NASULGC) and the Secretary of Agriculture jointly established a policy committee made up of representatives from Federal and State agencies called the Agricultural Research Policy Advisory Committee (ARPAC). ARPAC research planning and coordination activities were supported by a structure of national and regional planning activities called

the National Planning Committee (NPC) and the Regional Planning Committees (RPC). ARPAC sought to promote communication among experiment stations and Federal research agencies and to facilitate a joint planning process that would provide a national overview of the total publicly-funded research in agriculture and forestry. To accomplish this end, ARPAC organized task forces, special study committees, and workshops designed to make an indepth review of a given cluster of problems. It was in this framework that the joint USDA/NASULGC task force for forestry and associated rangeland research was created and charged to develop plans for forestry research programs through the year 1985.

(Effective December 31, 1977, the USDA notified NASULGC President W. G. Terrell that the Department was cancelling ARPAC's charter on the basis that joint Federal-State planning-coordination functions will be a responsibility of the newly created Science and Education Administration; i.e., Joint Council on Food and Agricultural Sciences of the USDA and the major advisory/policy councils established by Title XIV of the Food and Agriculture Act of 1977.)

A number of institutions and agencies are involved in the planning process we are discussing at this Conference. Six agencies of the USDA, 56 state agricultural experiment stations, 61 schools of forestry, 16 land-grant colleges of 1890, and Tuskegee Institute conduct an estimated 95 percent of the Nation's agriculturally-oriented research (*Hearing Report*, Subcommittee on Science, Research and Technology and the Subcommittee on Domestic and International Scientific Planning and Analysis of the Committee on Science and Technology, U.S. House of Representatives, June 25-26, 1975). Each of these entities participates actively in the national planning effort. In addition, by interacting with representatives of industrial research organizations and the Renewable Natural Resources Foundation, the magnitude of the planning undertaking and its scope of the study become increasingly apparent.

One of the important elements which will be considered in this review is the need for better technology transfer through the extension service. The knowledge transfer capability of the Cooperative Extension Service greatly magnifies the effectiveness of a "public research system" and provides for a two-way communication and feedback system for evaluating new technology and identifying problems needing research attention.

In July 1976, following the success of the

ARPAC-sponsored Kansas City Workshop on "Research to Meet U.S. and World Food Needs" held in 1975, Robert W. Long, Former Assistant Secretary of Conservation, Research and Education for the USDA, established a steering committee of four research administrators representing the USDA and universities. The committee's charge was to develop a "National Program of Forest Resources Research." In developing this national program, projections for forestry research directions and needs for the years 1980 and 1985 are to be based on guidelines contained in the program called for by the Resources Planning Act of 1974, with the added proviso that university research growth will be twice the rate of Forest Service research growth during this period.

The opinions of users of forest and range research information, together with scientist estimates of current and future research needs, whether at the regional or national planning levels, constitute the raw material for the present renewable resources national planning effort. USDA and university research administrators will be guided in setting planning goals by advice from the public and private sectors reflecting a broad range of public interests and concerns.

Present Level of Forest and Rangeland Research

In 1975 the Forest Service together with the universities (State agricultural experiment stations and forestry schools) expended about 1,535 scientist-years in forest and rangeland research. Of this total effort, almost 60 percent was carried out by the Forest Service and 40 percent by the universities.

Forestry research has concentrated on production, protection and harvesting, and processing and marketing of timber products (68 percent). A major portion of this effort has been carried out by the Forest Service. Research into problems of range, wildlife and fisheries habitat, together with forest recreation, esthetics, and landscape values account for most of the remainder. Research in these areas has been done mainly by the universities.

Need for Further Effective Coordinated Research Based on Planning

Full and continuing benefits from forest and range resources cannot be realized without a dynamic research program designed to maximize these benefits. By all estimates, the role of research will be even more important to forestry's future than to its past.

1. Projected timber demands call for a 73-percent increase in timber production by the

year 2000. Demand for small-game hunting is likely to increase 21 percent and use of water resources, 23 percent; outdoor recreation activities, many in a forest environment, are expected to increase by as much as 133 percent by the year 2000.

2. Efforts to meet increasing demands will risk conflict among alternate uses of forest and range resources. Research is our best hope of finding ways to resolve conflicts through multiple-use management.

3. Increased research is needed if we are to meet projected demands on a forest-land base which continues to decrease.

Objectives of Regional and National Planning for Forest and Associated Rangeland Research

The joint USDA-ASCUFRO forest-range research planning effort sponsored by ARPAC had two principal objectives: To develop a national policy for forest and range research; and to identify local and regional research needs, attach priorities to these needs, and encourage cooperation between researching organizations in meeting these needs. Within these two broad objectives, it is hoped that current efforts will yield results which can be used by:

1. The U.S. Forest Service in its 1980 update of the Forest and Rangelands Renewable Resources Planning Act (RPA).

2. The forestry schools and State agricultural experiment stations in the development and implementation of research priorities which reflect regional and possible national needs.

The Planning Process and Information Base

Current planning for the National Program of Research for Forests and Associated Rangelands is being carried out using the information stored in the USDA's Current Research Information System (CRIS). CRIS, which is operated by CSRS, is a computerized retrieval system containing comprehensive information on agricultural and forestry research that has been, and is currently being conducted by six USDA agencies (ARS, FS, ERS, CSRS, Farmer Cooperative Service, and Statistical Reporting Service), 56 State agricultural experiment stations (including most of the forestry schools), and 25 other cooperating State institutions.

Specifically, the CRIS forest and range research information, together with consumer or user input data that are used in the current planning effort, are included under the broad categories (RPG 1.00), Natural Resources and (RPG 2.00), Forest Resources. These categories

cover the following broad research areas in forestry and range investigations:

1. Multi-resource inventory, appraisal and evaluation.
2. Timber management.
3. Forest protection.
4. Harvesting, processing and marketing of wood products.
5. Forest watersheds, soils and pollution.
6. Forest range, wildlife and fisheries habitat development.
7. Forest recreation and environmental values.

The success of research planning in agriculture or forestry is, of course, dependent in part on the completeness and usefulness of the data base—in this case the research information stored in CRIS which depicts the state of the arts. One of the present planning objectives is to make CRIS more reflective of the needs of both users of research and those who plan for future research.

In comments on the report of a special oversight review of agricultural research and development by the Subcommittee on Science, Research and Technology and the Subcommittee on Domestic and International Scientific Planning and Analysis of the House Committee on Science and Technology, former Assistant Secretary Robert Long and I, as co-chairmen of ARPAC, stated the following.

"The success of agricultural research has been a result of its broad frontal attack on a wide range of critical problems. We must continue to prioritize those problems and focus the research on the most important targets, but our future thrust must continue to be broad and encompassing if benefits commensurate with the need are to be achieved and if pitfalls from environmental, economic and social disruptions are to be minimized. Therefore, when considering future levels of support, we urge you to stress the need to provide it to the array of vital areas of the entire system."

The structure of planning agencies should change with need, and their *modus operandi* should be consistent with the essential flexibility and diversity of the joint Federal-State system for planning research. The essential elements must be preserved—that is the freedom for scientists to work, the flexibility and diversity of the system, and the recognition that cooperative long-range planning is sound policy for science administration and is in the public interest.



Section VI

A REVIEW OF RECOMMENDATIONS OF THE RANGELANDS RESEARCH POLICY SYMPOSIUM



Dr. Stephen H. Spurr, Chairman, Renewable Natural Resources Foundation Forest and Rangelands Research Policy Symposium. Currently Professor, Botany and Public Affairs, Lyndon B. Johnson School of Public Affairs, University of Texas. Former President, University of Michigan; Dean, School of Natural Resources, and Dean, School of Graduate Students, University of Michigan. Also various teaching and research positions University of Minnesota, and Graduate Research Institute at Harvard.

Research in forestry and associated rangelands has not always held the center of the stage in the arena of American sciences. In recent years, the increasing cost and diminished supply of fossil fuels has led to increased interest in the use of renewable resources, primarily trees, for industrial materials, fuel, and energy. Greater use of trees is no longer a question of whether but of when. Our need of forests to process our air and water and provide us with space for human needs and enjoyment is becoming critical. Our needs underlie the effort we are culminating today.

My assignment is to report briefly on the symposium held by the Renewable Natural Resources Foundation at Airlie House, Warrenton, Virginia, May 31-June 3, 1977.

Our scope then was to look in broad terms at the policies for guiding and administering federally funded research. Our concern was not with current and projected research programs. Rather, it was with the overall research system as it exists today and as it should be redirected in the future. We were charged to suggest changes in orientation, planning mechanisms, and management methods that appear necessary to better serve the future.

The 18 panel members were selected by the Renewable Natural Resources Foundation to represent a wide range of disciplines, interests, and organization affiliations outside of the Federal Government. Several of the panel members are here today and will participate in answering questions as I finish my brief report.

In the background statement prepared by S. Blair Hutchison and M.B. Dickerman for the Renewable Natural Resources Foundation, we were reminded that, although almost 6 percent of the gross national product is derived from wood, less than 1 percent of the total research and development budget in the United States is invested in forest and range research.

Federally funded research is largely carried out by the Forest Service as authorized by the McSweeney-McNary Act of 1928. A much smaller amount is undertaken by 60 public forestry and natural resource schools under the provisions of the McIntire-Stennis Act of 1962. About 1,500 scientists are involved in these efforts at an annual cost of over \$100 million. More than as much again is funded in the private sector.

After reviewing the five issues to be considered by the symposium, the Foundation paper reminds us that:

The time is not far off when the United States will have to weigh its aspirations against the limits set by availability of materials, technological prospects and environmental needs. The soundness of the decisions made then and the ability of the country to carry them out effectively are going to, in considerable part, depend on the state of the knowledge. That in turn will depend to some degree upon the capacity of forest and range research groups to tighten and perhaps refocus their operations to meet increased responsibilities more efficiently.

The program of the Forest Service is carried out by over 900 research scientists with a total budget for fiscal year 1977 of approximately \$87 million. Nearly half of the scientists hold the PhD degree. Fewer than 40 percent are foresters: their median age is 46.

Important issues to the Forest Service are the degree of decentralization most desirable for its research effort, how to improve the quality of research and the dissemination of research results, the relative importance of basic research, and the desirability of a competitive grants program. The Federal funding of the McIntire-Stennis program is currently at \$9½ million. It has particular impact on the training of graduate students. Approximately 40 percent of the total PhD's granted by public

forestry schools have been supported in part by McIntire-Stennis funds. Each project is handled separately. As of 1975, 597 projects were approved for funding, generally for a 5-year period.

The 3 days devoted to the discussion of national research policies at the Airlie House elicited many comments and developed many concepts. After it was all over and after the individual recommendations were correlated and integrated into a final statement by the staff, we ended up with eight broad issue areas and 19 specific recommendations.

Under the general rubric of *broadening both the institutional base and the emphasis of the research*, we concluded we should move in the direction of involving a greater segment of the scientific community from a broader range of institutions in research on a more inclusive set of problems. Substantially more effort should be put on basic research. The skills of scientists trained in fields other than forestry should be applied to natural resource problems. In addition to the present reliance upon land-grant universities, other institutions, both public and private, should be involved in our overall research effort. The end result should be increased attention to environmental and ecological problems and to uses of the forest other than timber management.

Three recommendations came under the general issue of how to *strengthen research planning*. These were (1) that better planning was needed at the national level; (2) that such planning should involve all organizations involved in forest and range research; and, (3) that the present major research capability in the Forest Service should be maintained and enhanced. The Resources Planning Act of 1974 gives the Forest Service responsibility for a nationwide assessment but assigns program responsibility to it only for its own activities and responsibilities. A mechanism must be found to provide for natural resource planning on a continuous basis that involves all the responsible organizations. Within this overall plan, however, a tight liaison should be maintained between research and public resources management.

This issue of how to *increase research effectiveness* spawned five recommendations. Our national research program has been strong, but can be made much stronger. Some of our research scientists have been highly productive and have turned out significant results. Other research has been pedestrian. To provide a stimulating and vital environment, centers of excellence should be developed involving both governmental and university scien-

tists. Room must be found for a continuing inflow of young scientists, while established scientists should be kept up to date and broadened in their interests by exchanges, leaves, and special assignments. We should work for the public recognition of distinguished research effort, including the forwarding of qualified scientists for membership in the National Academy of Science.

We stressed the importance of competitive grants in eliciting research prospects, in enlarging the scientific community involved in forest and range research, and in maintaining the interest of highly capable scientists outside of the Federal agencies and the land-grant universities. Competitive grants should permit us to be more responsive to newly emerging problems. Our assumption was that competitive grant programs should be funded with incremental additions rather than through the reallocation of existing funds.

The "centers of excellence" concept needs further thought and development. Our present research effort is spread out thinly over 82 Forest Service research unit locations and 61 forestry schools. While there are many advantages to the decentralized approach, there is also the need for larger research units which can bring together enough scientists to create the critical mass and the sophisticated facilities needed to deal with the complex problems of today. We did not endorse at this time the establishment of a single national laboratory. We did feel, however, that steps should be taken to create centers to deal with such problems as inevitably arise from national policy planning activities and ecosystem research.

To improve the cooperation between agriculture and forestry, the Airlie House symposium recommended that "a more effective and viable partnership is needed between agriculture and forestry in the U.S. Department of Agriculture and in the land-grant colleges and their associated State agricultural experiment stations." The point is obvious. We did not discuss the reorganization of the Federal Government in the natural resources area, but simply added that, in any reorganization, cooperation between the several government bureaus can be improved greatly, as can cooperation between the universities and the government agencies involved in natural resource research.

How to improve the delivery of knowledge? Getting scientific knowledge into use has never been easy. Much effort has been expended but much remains to be done. In the area of extension, forestry manpower is ex-

tremely limited. At present, there is an average of only three extension specialists per state to cover all aspects of forestry, timber harvesting and use, wildlife, water and range management. Certainly our extension and technical assistance programs need to be strengthened. In a broader sense, we should be able to improve the dissemination of research results to the practitioners and to the public.

Despite the fact that the United States is both a major importer and exporter of forest products, we carry on very little research abroad. We need to develop an international renewable resources research program. Our Federal agencies are not only doing very little, but also lack the Congressional mandate to do more. For our own planning, we need to know much more than we do about tropical forestry. For our own forest management, we can learn much from others, particularly the northern European countries. We recommend that "legislation should be enacted to permit the Forest Service and the universities to participate more actively in international renewable natural resource research programs in the developed and developing countries. Exchange of scientists should also be authorized."

Our concern is not with government agencies and universities alone. There is much that can be done by individuals, whether speaking for themselves or acting through a professional society. To increase the influence of the renewable natural resource sciences, forest and range scientists should play an active role. We have knowledge and understanding that can contribute to the establishment of wise policies. We have research results that should be considered by those engaged in the policy debate. We ourselves should participate actively.

Finally, the Airlie House Symposium dealt with specific suggestions to strengthen the legislative base. We recommended that both the McSweeney-McNary Act of 1928 and the McIntire-Stennis Act of 1962, effective as they had been, needed to be updated to meet current research needs. Several of our recommendations need the force of law in order to be implemented. These include the authorization to establish larger research establishments in selected locations to permit the development of cooperative centers of excellence by the Forest Service and the universities, the use of competitive grant procedures in addition to baseline financing by the Forest Service and the forestry schools, and the establishment of an international program of natural resources research. Funding is, of course, needed for these items. Indeed, across

the board, more funding for research is needed from both industry and public sources if we are to develop the full potential of our forests and rangelands.

Research Needs

The Airlie House Symposium was concerned only with research policies. It did not deal with programmatic needs. Yet, inevitably, the panel members as individuals had ideas as to some of the more important needs in the programmatic area. Let me finish with a few comments that I feel should be taken into consideration in developing our future research programs. I speak now only for myself.

First, several major efforts have been staged in the past few years aimed at the development of a national policy for our forests and related renewable natural resources. These include the 1973 *Report of the President's Advisory Panel on Timber and the Environment*, and *Outlook for Timber in the United States* produced by the Forest Service in 1973; the *Assessment and Program* prepared for the Resources Planning Act; and the report on *Renewable Resources for Industrial Materials* published by the National Research Council also in 1976.

Competently researched and written as these studies were, one cannot work with them without being impressed by the lacunae in the data available to the various authors. In many areas, we haven't done the research needed to make informed decisions on national policy problems possible. All too often, we have had to extrapolate from inadequate factual information. We have had to deduce from small and often nonrepresentative samples.

I suggest that, in developing a long-range research program, these and similar documents be carefully studied to identify what we should have done in the past to help elucidate policy issues of today. We should certainly be able to identify research projects that will be needed to shed light on policy issues that we shall be dealing with in the near future.

Second, the National Forest Management Act of 1976 specifies a number of items that require clarification through research. In the periodic assessments, the Secretary of Agriculture is directed to cover the additional fiber

potential of the national forest system, the potential for increased use, the maintenance of forest cover to secure the maximum benefits of multiple use sustained yield management, and the development of a program to eliminate the backlog of lands needing to be planted. Restrictions on timber harvesting, including the enactment into law of the Church guidelines on clearcutting, raise issues that must be investigated through research. So also do the requirements for classifying lands not suited for timber production, the establishment of rotation age as the culmination of mean annual increment, and the determination of annual cut at a level which can be removed from a forest in perpetuity on a sustained-yield basis. Substantial research, both ongoing and new, is needed if the provisions of this Act are to be intelligently interpreted and enforced.

Third, we have inadequately researched a number of problems which have become major issues in the adversary proceedings between environmentalists and forest managers. These include productivity and nutrient loss comparisons between even-aged and uneven-aged forests composed of different species and growing on different sites; productivity and nutrient loss comparisons between monocultures and polycultures under a wide range of conditions; and relative risk of these stands from insects, diseases and other hazards. These are major issues of the day. We are sadly lacking in definitive research studies which have a broad application in shaping national forest policy.

The list of research needs is long and need not be presented here. The types of problems I have identified are basic to the establishment of national policies and fall within what might be called macro-forestry rather than micro-forestry. Just as we have developed research in macro-economics to deal with such problems as gross national product, inflation, and unemployment, so, too, we need research in macro-forestry to deal with such problems as productivity, risk, sustained yield and allowable cut for the Nation and the world as a whole. We must expand and broaden our research effort. We must see the forest for the trees.

POLICY SYMPOSIUM

QUESTION AND ANSWER PERIOD

Following Dr. Spurr's remarks, symposium panel members assembled to respond to questions. Seven panel members present included:

Stephen H. Spurr, Donald Burzlaff, Texas Technological University

Ray Johnson, Private Consultant

W. Leslie Pengelly, University of Montana

R. Keith Arnold, University of Texas

Benjamin A. Jayne, Duke University

James L. McKenney, Harvard University

*DR. ROBERT BUCKMAN: I am with the Forest Service. On behalf of those of us who commissioned this inquiry into science policies—this includes the 60 forestry schools, the Cooperative State Research Service, and the Forest Service—we believe we have received a most responsible product. We were pleased with the caliber of the panelists. We were pleased with the work of the secretaries who carried the work forward—Mr. Dickerman and Mr. Hutchison. We have also indicated to the Renewable Natural Resources Foundation and to the panelists, in writing, that we will collectively provide a response to the report.

The report has been in our hands for almost 2 months. Within the Forest Service, our research staff and researchers have discussed some of the recommendations. The one that has received the most discussion concerns "centers of excellence." On the face of it, it is an attractive and appealing concept whose time has come. As we look into that question in greater detail, we are not so sure what the panel had in mind as "centers of excellence." I think it would be helpful if the panelists might discuss what their view of a "center of excellence" is, and how it might be administered.

DR. SPURR: Obviously, this is a complex issue. Forestry is not simple, so we cannot have a single national laboratory where we concentrate much of our national effort. We have to be much more flexible in forestry if we are to develop a center of excellence, although we obviously ought to have some sort of geographical concept that limits it. We have to be rather flexible in putting together a model. I can easily conceive of a center of excellence not being in a single location but bracketing a geographical area, or the whole United States, such as two or three forestry schools working with two or three laboratories in the same

area. A community of scholars, in this present day and age, need not be physically located together, need not be working on a tightly defined problem, but may be working on corollary problems in a group that is interactive.

DR. ARNOLD: I think the effort that Resources for the Future is starting in forest economics and policies has the making of the center of excellence of the kind Steve indicated—a small but highly competent, specialized group with emphasis, particularly, in the nonmarket, nonprice problem areas—the ones that have been the stumbling block in economics and policy matters since the dawn of forestry. All of the work will not be done in-house. There will be grants and contracts. There will be opportunities for professors on sabbatic leave to come in, and there will also be cooperative research with government scientists, both in the State and in Federal establishments.

DR. MCKENNEY: We have some very large land mass areas, and part of the fundamental problem I see of implementing research is that the natural boundaries are not consistent with the political boundaries of the United States. We don't know how to live with that problem very well. The problems are of an ongoing nature. Therefore, one of the centers of excellence I can envision would be a 10-to-20-year program in a large land mass such as northern California or eastern Texas, or perhaps the section of the South that would have a public policy flavor, but involve a broad range of scientists devoting their efforts to part of the problem, not only to understand, but perhaps to try out, processes that would relieve some of the resource problems we have, the inefficient conflicts of too small and too little, but also become a more proactive research effort of trying to bring to the field practice that was developed with a thoughtful research program.

*DR. STEPHEN SMITH: This Conference and the Airlie House Conference have stressed planning and structure of research and structure of research planning. I would like to hear your comments briefly on the interface between this kind of highly structured planning process, which needs to go on, and the individual scientist. His level is really where the productivity comes out, and his ability to be creative and have freedom in the selection of

projects and problems he works on is important. I believe sometimes they do get in conflict, and I think it is important for us in administrative areas to give signals to the scientists that we understand those problems.

DR. SPURR: The particularly long-term nature of forest and rangeland problems, and the complexity of any study we are dealing with, requires a high degree of planning. The planning must, in effect, initiate the actions that would result in funding the project. I don't think there would be any possibility of funding it for a long term in such a way that will maintain a productive effort over the years. At the same time, we realize the need for new concepts, particularly for the younger people to break ranks, come up with stimulating ideas and be funded. This is why we came out strongly for the program that would develop long-range planning. It requires a development of a staff committed to a plan. The competitive grants program we envision provides an opportunity for individual effort of great brilliance and uniqueness.

DR. McKENNEY: My experience is more in the industrial environment more than forestry. I think there is a large spectrum of industrial research that has found a way to give guidance and planning, and at the same time provide freedom.

If we look at the development of the basic technology of the United States today, it is 80 to 90 percent dependent on large laboratories—DuPont, General Electric, and the like—that are generating useful products and articulating the ideas of general research that need to be done.

For forestry to compete against dying babies and the social problems of the city, there is going to have to be a coherent program that articulates why the research should be done. It seems to me we have 2,000 issues and we still aren't started. How do we get political and social ideas measured, let alone solved? I think we have an abundance of ideas and concepts—it is time we figure out the priorities. If we keep continually doing 30,000 pieces of research, we are never going to solve the problem.

DR. BURZLAFF: One of the goals of our work on increased effectiveness of research at Airlie House was related to actually setting research goals and setting policies so people could set goals. Before you can develop any policy or do much of anything, you have to have some very specific, very definite, use policies estab-

lished, particularly when you are working with public lands, public resources. It is only after these objectives have been established that we can assess priorities, develop projects, initiate or implement activities, or even assess any progress toward solution of the problems that we set out to solve in the first place. So I would guess that research people who develop policy will have a very difficult time writing into those policy statements things that are going to assure any one individual scientist any considerable amount of freedom in selecting the amount of research he does to meet these goals because research has to be directed at goals—be goal-oriented.

DR. JAYNE: A very general kind of planning process that involves the universities, various agencies, the Federal Government, the private sector, coupled with a competitive grants system, can be invaluable in engaging many people in the planning process and also permitting the scientist to have freedom. The competitive granting system—there is always a great deal of exchange between the agency funding and the individual. Both are conditioned in the process. As a result of the process, the individual doing the research has a great deal of input into the planning system. Hence, that kind of funding system suggested by the Airlie House Conference could be invaluable.

*MR. NISSAN, WESTVACO: May I go back to the problem of centers of excellence? I think we must not confuse it with another concept—the invisible academy—which exists in every field of science wherein people worldwide keep in touch with each other. I think a center of excellence is different from this concept, and both are absolutely essential to research.

A center of excellence has to have a common facility for face-to-face continuous interaction, use of equipment together, so that specialists can help each other and a common cafeteria.

DR. ARNOLD: I think these first two questions can be combined. It is important that individual scientists in universities have the opportunity for freedom of work. A center of excellence with a funding to take people on during sabbatic leaves. A scientist or professor in the university may come up with a unique and brilliant idea. Quite often in the light of the responsibility for teaching, and committee work that goes on in universities, it is very difficult for him to pursue this activity. The center of excellence, with funding to move aggressively

into new areas, can make it possible for an individual to either go there or be funded in his institution, be relieved of teaching, so he can pursue the research.

*MR. WOLFF: I am Robert Wolff, Congressional Research Service. The 1974 Act, properly called the Resources Planning Act, has a full title of "Forest and Rangeland and Renewable Resources Planning Act." This program is entitled, "Program for Research for Forests and Associated Rangelands." I wondered if by adding the word, "Associated," you had some different definition than the 1974 Act plan?

MR. DICKERMAN: I am not too sure how that word got in there. It is used quite commonly in most of the references to research. I really don't think there was any intention of changing the definition or connotation that went with the 1974 Act.

*BILL SWANN: I am a cowboy from Idaho. I am interested in the "Associated Rangelands." I am interested in the production of food. If we are going to realize 54 percent of the land of the United States has only one productive capability, and that is to produce food for animals, it has been a sadly neglected and often abused part of our economy. It seems to me, again, in this Conference, we are taking a secondary role.

We hear all of this talk about timber and timber production and forests, and all of that. We have heard very little about rangelands. If the scientific community is interested in food production, in feeding the exploding population of the world, I think we need tremendous research on our rangeland resources. I think this Conference has again neglected rangelands, and I would like to hear some comments.

DR. BURZLAFF: I share your concerns to some extent in the nature and direction of the Conference. This is one of the reasons why I plead for some goal-setting on the part of the people who encompass forest and rangelands, so that the organizations involved in forest research can be truly multidisciplinary in nature, and that attachment of associated rangelands will have some real meaning.

To the best of my estimation, there is somewhere in the vicinity of 16 scientist-years allocated to range research within the Forest Service. That means out of 930 scientist-years of research capability within the Forest Service, less than 2 percent is directed at range research. Now, if we add to that the 12 or 15

scientist-years that are funded through McIntire-Stennis, and then add another 65 or 70 scientist-years that are funded under other agencies and by universities, you can see that we are not meeting the research needs of our rangeland resource.

DR. SPURR: This emphasizes one of the weaknesses of the RPA Act, which gives the Forest Service responsibility for programmatic planning only for its own lands.

The point that was made in the Airlie House Conference which I reiterated, was that we need planning at a higher level, or we need an agency or planning mechanism to give a planning agency adequate account of the areas that are being substantially neglected at the moment. Grazing is a major item in this category.

*MR. HENRY WILLIAMS: I am at the other end of the pole from the cowboy from Idaho. I am from the State of New York. The panels I have been involved with have been those associated with the urban perspective, and this represents the same kind of concern Mr. Swann expressed, but from another point of view.

We heard one of the speakers yesterday refer to the composition of this gathering and indicate that the need is to assure that the user perspective is properly addressed. This is particularly difficult when you consider the technical, economic, and social aspects of those who use forestry only in terms of the kind of products the forest produces, not in terms of the way the forest grows them.

We look at the results of the meeting we had so far this morning; we can see how this gathering responded to those issues. We see those higher rated, those related to management and the pure forestry aspect. I think if we look across this audience this morning, the vast majority are those directly related to the forest sciences, so to some extent the purpose of this gathering is self-serving.

DR. PENGELLY: I represent the Wildlife Society as the incoming President-Elect. What Bill's point is is the same thing the wildlifers have said. The wildlifer in a forestry convention is like a hernia at a weightlifting convention. I think we are doomed, in a way, to follow this pattern for awhile.

We went through the Public Land Law Review and the RPA. We agree, theoretically, we have finite resources. When we write the laws, we say we need more of everything. We are going to do bureaucratically what we can't do mathematically.

We have been faced with this for a long time in this country. We are now getting to where we have enough people so what you are asking for the range people, what I am asking for the wildlife people, is a more equal voice. The Multiple Use Act does not say "equal," it says, "equitable."

That is, what is honored in a community will be cultivated there. If more people want the money in trees than in range, I guess that is where it will go. If more people want it to go the other way, it will get reversed.

I believe what we are doing now is facing the issues, priorities, allocations. The three of us on this end of the table are for wildlife allocation, which is a surprise to me—it used to be one out of 1,500, so we are changing it gradually, and we will change it faster if we are good advocates and the public wants us to be.

MR. JOHNSON: I want to give the Wildlife Society a little support. You may have noticed in the book handed out this morning, in the overall rankings of all of the problems that have been discussed, the number 3 one came out on the effects of forest management on water quality. So we do have support in these related funds within the people here who are judging the rankings of these problems.

DR. SPURR: I would like to point out that the majority of the Airlie House Group were non-foresters, as is the representative sample up here. There are a couple of "Jacks of All Trades" at the head table, but a wide range of wildlife, fisheries, rangelands are represented in our Airlie House Group.

*MR. RUBIN PANKEY: I am a rancher from New Mexico. After watching all of you scientists and so forth for 2 days, and listening to you, I hope that when the results of this Conference are transmitted into reality, you keep your heads screwed on right and your viewpoints in the right place, and remember that we have to suffer your findings. Put them in such a form that we can use them, and they will have some reality.

DR. PENGELLY: This is what the scientists would refer to as a stochastic perturbation.

*MR. TOM EATON: I am with the Society of Municipal Arborists. I would like to comment on the questions brought up before and the answer seems to be the wildlife people are represented here.

I happen to be in Working Group 7, and I was delighted to work with the people in the

group. I felt that they had a diversity of ideas and were well able to express them, and it was a good group. But what I had a little problem with is the fact that the seven categories called for were mainly concerned with areas that have already been involved in Forest Service research as well as a couple of areas that are, maybe, new to forest research. I have a real problem with the overall group. I feel that there have been experts in each one of the groups. But in the overall group, which decides what areas are the most important, it is obvious that the groups are overloaded in the areas that have been concerned with research in the past.

*MR. WARREN ROBERTS: I am a hillbilly from West Virginia. I am representing the Building Supply Dealers of the United States at this meeting. I am a little bit concerned about funding for a research program. With some of this funding which comes from the Federal Government, certain guidelines have to be observed. This disturbs me. How much freedom are we going to have in the scientific community to follow through on a program, to draft a program and be independent in our research, when the bulk of the funding we are talking about is coming from the Federal Government?

An earlier speaker said in effect, "we will manage our forests the way people want it." Who is going to make that determination? Is it going to be the politician, the elected politician, the appointed politician, or the scientific community?

DR. McKENNEY: I think this is part of the thing Henry Vaux was raising yesterday. Right now we are doing that by the seat of our pants—that is, deciding who is the public the forest is really trying to serve. We are finding that is not an easy task to make that decision after you have involved people.

I think our own understanding is the society. Questions such as: How do you discern the balance between local needs of rural employment in Dillon, Montana, with national goals of preserving the environment—make implementation very difficult. That is a problem we are going to have to deal with seriously—rather than saying "it is the politician's fault," or "the scientists come up with things we can't educate the public to understand."

How do you implement national goals? I think, personally, we haven't learned how to do that. We delegate it to a lot of other sources and then brand it that the politicians aren't doing their job.

DR. ARNOLD: I think the first part of the question, dealing with how does the scientific community remain free—that is exactly the reason why a major part of research must be done in universities where Federal money cannot come in except for the subject area. The scientist is free to carry on his own research and free to publish, and that is a freedom that helps insure against the problem that you described.

MR. JOHNSON: Let me give a rather pragmatic answer to the last part of the question. There is an experiment being tried now in the management of our off-shore fisheries. Eight regional conferences are now regulating and controlling the catches, not only by U.S. fishermen, but foreign fishermen as well. This is the kind of an entity that has never been invented before. It is not governmental, not State, not Federal—it is quite public.

The specific point here is these regional councils have pumped up the need for information and the need for more research immediately.

*DR. ROBERT BUCKMAN: I would like to come in on a point made by Dr. Spurr about the Resources Planning Act. It is true that Act requires the Forest Service to take stock, to make an assessment of the resources on 1.6 billion acres of wildlands in the United States. The second part of the Resources Planning Act requires the Forest Service to prepare a plan to guide its own programs.

The Act, as I recall, requires us to take cognizance of the programs of other collaborators, but does not specify how we will work with them.

One of the things I hope is an outgrowth of this Conference, Mr. Chairman, is that we will develop mechanisms so the entire community can be a part of the Resources Planning Act.

I would like to point out the delegates and participants at this Conference have addressed a very substantial portion of it. If we subtract product development, process improvement, marketing research—most of which is done by the Forest Service—then you have addressed about two-thirds of all of the issues in forestry and rangeland research in the United States. We hope to display, as an outgrowth of this Conference, a research program that is in reasonable harmony and consistent with the issues that you have brought forth. But also, as an outgrowth of this Conference, we hope we can develop mechanisms so

that others of that remaining one-third who wish to join with us can do so.

*MR. NEIL GUTCHESS: I am a Regional Delegate from the Northeast. I'm interested in research as it affects us and other small manufacturers and users primarily, and secondarily manufacturers of forest products as differentiated from some of the larger forest companies. We rely heavily on local regional expertise that comes from the Forest Service and experiment stations for answers to particular problems which we deal with. We have dealt with these scientists on these regional local problems in our area and other people have dealt with them in other areas. Quite frankly, I am very much impressed with the capability of these people dealing with these specific unheralded problems. The problems are quite often highly technical, where the expertise that these people have is beyond what the small user has. We couldn't touch on these problems in this Conference, but I just want to point out that I, as a small manufacturer, am indebted to the Forest Service and these other universities and research facilities for the service that they offer in an area such as this.

DR. SPURR: I think, on that note, we will thank you. We have enjoyed serving you and hope our report is of some interest to you. I would like to turn the chair back to Hardy Glascock.

MR. GLASCOCK: Thank you very much, Steve, for that masterful job of leading this very valuable discussion. I do want to thank those participants of the Airlie House Symposium who were able to be here for your excellent participation.

I would like to take this opportunity, on behalf of the member societies of the Renewable Natural Resources Foundation to thank the Forest Service, the Cooperative State Research Service, and the Association of State College and University Forestry Research Organizations for the opportunity the Foundation had to conduct the Airlie Symposium, and finally call your attention to the fact that we do have some copies left of the report.

It is entitled, *A Review of Forest and Rangeland Research Policies in the United States*, and any of you that does not have one and would be interested, please request them from the Renewable Natural Resources Foundation, 5400 Grosvenor Lane, Washington, D.C., 20014.



Section VII

A PROPOSED POLICY AND PROGRAM FOR RESEARCH FOR FOREST AND ASSOCIATED RANGELANDS FOR THE 1980's

This section of the Conference included a major policy address by Dr. M. Rupert Cutler, Assistant Secretary of Agriculture for Conservation, Research, and Education, and reactions to the address by a key user and a cooperator. Mr. Jack Muench, Director of Economics, National Forest Products Association, introduced those responding to Cutler's remarks. Dr. Cutler was introduced by Brock Evans, as the "right man, at the right time, to try to strike a balance between the many demands on the forest and related resources."

POLICIES FOR THE FUTURE



Dr. M. Rupert Cutler, Assistant Secretary of Agriculture for Conservation, Research, and Education, USDA. Former Assistant Professor, Resources Development and Extension Specialist in Natural Resources Policy, Michigan State University; Assistant Executive Director, Wilderness Society; Managing Editor, "NATIONAL WILDLIFE" Magazine; Assistant Chief, Conservation Education Division, National Wildlife Federation; Chief, Education Division, Virginia Commission of Game and Inland Fisheries; and Executive Secretary, Wildlife Conservation Inc.

We're talking about 1.6 billion acres of land. You'd think that would be enough for any purpose.

We're talking about nearly two-thirds of this

Nation's land.

We're talking about an area that would be the sixth largest country in the world if it were a separate entity.

Yet some people question whether this will be enough land to meet all our forest and rangeland needs in the future.

You know the problems we face—and problem solving is one of the major purposes of our research programs:

- Demand for forest products, both commodities and other outputs, like recreation, continues to grow.
- To meet this demand, some suggest that timber production may have to be increased by 73 percent by the year 2000, and more than 100 percent by 2020. Others suggest that improved use of existing production will help fill the bill.
- In any event, it's generally agreed that we must find ways to increase growth on the more than 500 million acres of forest land now producing at far below their potential. Recognizing this, President Carter in his environmental message called for a comprehensive review and improvement of the cooperative forestry program.

Competing demands on forest resources are placing new pressure on the land—and on land managers. Increasing the output of one product often means decreasing—or even eliminating—production of another. The decisions as to which potential users “win” and which “lose” aren't easy.

To all these factors, we must add concerns about the quality of human life and protection of the natural environment. The environmental concerns which became national policy in the 60's and 70's force a second look at some of our resource management practices, and require us to develop new forest management technology that is environmentally sound.

Increased population growth assures us that these challenges will continue over the next several decades.

We have a lot of problems to solve. That's why we're here. Obviously, we need research. Equally important, we need to examine our research policies.

Research has given us the answers we needed in the past.

In the Dust Bowl Period it was forestry research which came up with fast-growing tree shelterbelts to protect millions of acres of land from erosion. That same information is helping other nations produce fuelwood today.

Forestry research found better ways to detect forest fires, so that wildfire losses have been reduced by two-thirds from the 1930's.

New housing designs from forest products research reduce construction costs and the use of lumber.

This week we are discussing a policy for forestry research in the future.

This is a historic meeting. This is only the fourth time in our forest conservation history that we have conducted an exhaustive inquiry into forestry research priorities, policy, and needs.

This is the first time that the users of our forests—the consumers of our resources—have been involved formally and in such large numbers in this kind of conference.

It is fitting that such a meeting should occur in the year of the 50th anniversary of the McSweeney-McNary Act and the 16th anniversary of the McIntire-Stennis Act, our two foundation stones in forestry research.

It is appropriate, too, to be meeting just as we in the U. S. Department of Agriculture have completed significant reorganizations and established new priorities to better serve the people.

As a Nation, we seem to have arrived at a new understanding of the role and purposes of our forests.

Two major laws signaled the final breakthrough—the Forest and Rangeland Renewable Resources Planning Act of 1974 and the National Forest Management Act of 1976.

The Resources Planning Act, or RPA, calls for periodic assessments of the renewable resources of the Nation, under all forms of ownership. Never before have we had such a comprehensive base of resource information from which Federal agencies, States, and private owners can build long-range programs. (And we'll be linking with the RPA, the Department's new authority to appraise the Nation's soil and water conservation needs, under P.L. 95-192, the Soil and Water Resources Conservation Act, or RCA, which will be implemented under Soil Conservation Service leadership.)

The RPA requires the Forest Service to present a long-range program of its activities to the President and Congress every 5 years. This program is then to be the focal point of the budget process.

The National Forest Management Act, built on the RPA, calls for long-range, interdisciplinary planning—and for public involvement throughout the planning.

For many years, the Department of Agriculture wanted to develop forestry programs based on long-range planning, tied to adequate budgets, and matched to the needs of the people. Now, we have that and much more.

To carry out the new initiatives that the people have demanded, excellent research—with its results delivered into the hands of those who need it—is absolutely essential.

Development of a national program of research for forests and associated rangelands would speak clearly to that.

Representing about two-thirds of the forestry research in the United States, not counting product development and improved manufacturing processes, the group charged with drawing up this program—the principal sponsors of the Conference—is also taking a critical look at the research policies which we ought to be pursuing.

I can cite several major policy needs.

For one, the legislative base for forestry research and technology transfer must be strengthened. There are now three bills pending before the Congress directly related to this need.

They are H.R. 8021, which modernizes the McSweeney-McNary Act; H.R. 8020, which places major new emphasis on technology application; and H.R. 8022, which would make the technology of renewable natural resource management and use more readily available to those who need it by providing a new charter and sorely needed statutory emphasis to forestry and wildlife extension.

I have not adequately described these legislative efforts. Suffice it to say that, together with Title XIV of the 1977 Farm Bill, enactment of these proposals would provide an unprecedented opportunity for new program directions in forestry and other renewable natural resource management programs.

A second major policy need is to strengthen information delivery systems for forestry and renewable natural resources. Having spent part of my career as a natural resources extension program leader, I know how important it is to get resource information to all users of our forests.

Specifically, we plan to take the following steps:

- A strong natural resources research and extension program will be established within the new Science and Education Administration which will be fully coordinated with forestry research conducted by the Forest Service, the Economics, Statistics and Cooperatives Service, other Federal agencies, the States, universities and industry.
- The National Research and Extension Users Advisory Board will be urged to promptly establish a working panel on forestry and renewable resources.
- The technical assistance programs in forestry and other renewable natural resources of the state and private forestry

program of the Forest Service and the action programs of the Soil Conservation Service will be improved.

- Ties among extension, technical assistance, and forestry research will be strengthened through the planning and coordinating mechanisms established within our new Science and Education Administration.
- Through the educational and technical assistance programs of the Department of Agriculture, our experience and expertise in land use planning will be shared with State and local governments, as well as with other Federal land-managing agencies.
- A program in natural resources parallel to its program in commercial agriculture will soon be established in SEA's Extension unit to provide overdue Federal program leadership in the transfer of natural resources research findings to users.

We have excellent opportunities to do all this through the various mechanisms provided by Title XIV of the recently enacted Food and Agriculture Act of 1977. The newly created Science and Education Administration promises to result in the application of more scientific resources to forestry and other natural resource management problems.

Consider what the combination of Title XIV and SEA offers:

Title XIV specifically encourages all qualified scientists to participate in basic plant research and human nutrition research programs through a competitive grants program. The pending forestry research legislation, H.R. 8021, will provide similar authority for forestry research competitive grants to be administered by SEA.

This year, the Competitive Grants Office of the Science and Education Administration will administer a \$15 million research program aimed at increasing the basic knowledge required to meet national and world food needs. Emphasis will be given to funding those proposals which (1) solve today's problems and (2) also offer an early use of results. This competitive grants program should also be open to the forestry sciences so that the basic knowledge needed for wildland management and urban forestry can be developed. I plan to give support to adequate funding of competitive grants for forestry research as soon as such a program is authorized by the Congress, as a third policy initiative.

The importance of continued base funding for major forestry research-performing orga-

nizations such as forestry schools, agricultural experiment stations and the Forest Service cannot be overemphasized. Base funding for research under the McSweeney-McNary and McIntire-Stennis Acts, and from State sources, is essential because it's impossible to maintain a strong, balanced staff of scientists on competitive grants, or "soft money," alone.

A fourth policy initiative concerns the quality and balance of forestry research programs.

I believe we must strengthen existing centers of excellence in forestry research and speed development of additional centers.

We must give increasing attention to the basic sciences that undergird forestry. We have already seen many examples of payoff from earlier basic research in forest genetics, mycorrhizae studies, and characterization of the physical and chemical properties of wood.

We need to greatly strengthen research concerning wildlife, recreation, and other noncommodity values and uses. Commodity-related research programs will be continued, but I strongly support additional research in such areas as wildland recreation, fish and wildlife habitat management, watershed protection and management, wilderness administration, urban forestry, land-use planning and environmental education techniques.

Research in these areas has lagged considerably behind research dealing directly with timber for far too long, and a balance must be achieved.

A fifth policy initiative would strengthen international forestry research and development programs. Benefits would include a better understanding of world trade in wood, better control of introduced insect and disease pests, an intensified search for improved plant and animal germ plasm, and a more rapid adoption here of forestry technology developed abroad, such as Scandinavian technology applicable in Alaska.

And we have much to offer the rest of the world from our own research and experience.

The vast array of forestry talents in the Forest Service, the Soil Conservation Service and the forestry/agricultural community at large should be made available to the developing areas of the world. Through these international efforts, we can contribute to the Administration's effort to improve living conditions of the poor, protect and enhance world food production capacity, and help reverse deterioration of vital ecosystems.

A sixth issue concerns the need to improve coordination among those who conduct forestry and renewable natural resources research.

Some two-thirds of the forestry research is conducted within or in association with the Department of Agriculture. We now have excellent coordinating and communication devices within USDA, and between the Department, the forestry schools, and State agricultural experiment stations.

However, I believe it is necessary to join our efforts more closely with those of other organizations—Federal, State and private—which conduct the remaining one-third of the forestry research to encourage the efficient use of financial and human resources for scientific endeavor. I suggest:

- Broader use of the Current Research Information System of the Department of Agriculture. Specifically, I want to extend an invitation today to the Fish and Wildlife Service, the National Park Service, the Bureau of Land Management, the Environmental Protection Agency, and others to join with us in this or a compatible reporting and information system.
- Expanded use of the natural resources section of the National Agricultural Library and of the regional libraries of information networks (WESTFORNET) now being developed by the Forest Service and its university partners in the western half of the United States.
- Organization of a panel under the Federal Coordinating Council for Science, Engineering and Technology dealing with renewable natural resources.

A seventh and perhaps most important initiative, which I support, is to improve and expand arrangements for jointly determining research needs. We need improved communication between research users and our research scientists. Meanwhile let us strengthen proven arrangements for getting at national, regional, and statewide needs.

Other policy issues rest largely with you: How much and *what* kinds of forestry research are needed? Who should participate? At what level should it be funded? Who should provide the funding? These and many other questions demand prompt answers if we are to make the best possible use of our forests and rangelands. You will ask them, I know. Then together, we will seek the answers.

RESPONSES TO DR. CUTLER'S REMARKS . . .



PRESIDING: Dr. John Muench, Jr., Director of Economics, National Forest Products Association. Former Assistant Professor of Forestry at Pennsylvania State University.

We have with us today representatives of three forestry interest groups who will comment on the presentation we just heard from Dr. Cutler. I can relate to all three of these speakers. First, I am a professional forester and one of the speakers is a leader in my professional organization. Second, I work for

a Forestry Trade Association and one of the speakers helps pay me salary, and third, I support several conservation associations and one of the speakers is well known for representing the conservationist's viewpoint on forestry issues.



THE NATURAL RESOURCES COUNCIL OF AMERICA

Mr. Brock Evans, Director, Washington Office, Sierra Club and Federation of Western Outdoor Clubs. Former Northwest Representative, Sierra Club; and private practice of law

I want to say a few things first, which I think reflect the perspective of the conservation and user organizations of the Natural Resources Council of America.

That's not an easy thing to do—reflect the perspective of all of these different groups. NRCA is a very diverse organization—its 46 member organizations span the conservation spectrum from the preservationist to the wise-user philosophy, from animal protection to sports hunting, to controlled forest harvests. This sounds like it ought to be a pretty fractious group, but they are not, and it is not. In fact, I have always been struck by the remarkable degree of common viewpoints shared.

One of the things I think we are most agreed on is the need for more research. This is largely because many of our member organizations have been around a long time, and have witnessed many environmental conservation controversies—seen many issues raised by various user groups come and go.

Our member groups have shared many struggles over the years, along with all of you: struggles for better forest and range management, struggles to assure more consideration of fish and wildlife, struggles to protect certain parts of our public lands. In each one of these issues, the one great crying need was for facts, the kind of hard, uncontrovertible data from unquestionably reliable sources that everybody could rely on. Sometimes the decision-makers had it; sometimes they didn't—and so sometimes their decisions were good and stood the test of time, and sometimes they weren't so valid and had to be redone later with even more controversy.

I could not presume to speak for each NRCA member individually, but I think I can report to you a strong consensus on the value of and need for more research. It is such an obvious thing. Dr. Cutler said it best in his printed remarks: "I believe that the outcome of many of our policy issues would be different, or in any event the decision would be vastly improved, if we could better and more confidently predict the consequences of our actions on such resources as wildlife, soil, water, and air."

To this, we can only say, "Amen." None of us likes controversy. All of us seek to avoid it. And all of us want decisions that stick, decisions based on hard evidence, exact knowledge of consequences.

These are the kinds of decisions that are enforceable and that are perhaps the greatest contribution of the research community to your country and the betterment of society.

So, this brings me back again to Dr. Cutler's remarks. He outlined a broad program

with emphasis on all kinds of research and some new initiatives, such as strengthening the international forestry research and development program. From what I know of our people, I would predict that there would be strong support from most NRCA organizations for almost all of it. We do need more in the basic sciences, in wood utilization, in better forest management techniques. We strongly favor Dr. Cutler's new emphasis on a true interdisciplinary approach—that is the way to give us the balanced decisions we need, I think.

I would like, most strongly, to support Dr. Cutler in two of his statements which I hope will become major program emphases for the next decade or so. The first was Dr. Cutler's call for the need to strengthen research in esthetic and noncommodity values. First, we have a public much more sophisticated and much more aware and interested in forest and rangeland issues than it was at the time of the first national plan in 1966. Second, and this ties in with the first reason—this more sophisticated public is much more interested in resources such as wildlife and recreation, than it is in commodity production.

A recent poll conducted by the Opinion Research Lab at Princeton, New Jersey, and sponsored by our colleagues in the forest products industry, bears this out.

One of the key questions was: "Did people want more trees cut or more timber sales, or to preserve trees in their natural state?"

The answer, more than 2 to 1—I think the figure was 62 percent to 28 percent—was to preserve them, with all the amenity and esthetic connotations this implies.

I believe that in view of this dramatic expression of public opinion, the need for research in these areas is even more important.

This is because we know that we have to continue the production of wood and fiber from public forests. All of our organizations in NRCA support this. At the same time, we have to satisfy and speak to legitimate demands of an increasingly sophisticated public for more amenities.

Research can do this. You have already done wonders with wood utilization research, sometimes achieving a doubled or tripled yield of wood from the same log. I want to compliment all of you who have been involved in this and urge you on to continue in this way.

So these, we hope, will be two of your major emphases over the next 10 years or so while you continue on your other important work—first, to give us more information about all our forest resources—where they are, what affects

them, how their supply can be improved. And, second, at the same time, keep and even accelerate the momentum you've already developed in wood and fiber and forest use to find more ways to get us more, and increased volumes out of the same acres. Your aim should be to give us a bigger pie to slice up, more timber, more wildlife, more wilderness and more water, rather than forcing us to continue these controversies over who is going to get an ever smaller piece of an ever-shrinking pie. You can do this, I think, and we will support you in it.

As Rupert said, this gathering is truly a unique event. I know of nothing else like it, nothing like the well-organized way you've hammered out your findings and conclusions. There is nothing else quite like it in American life, as far as I know, and certainly not in the resources field.

That fact alone makes this effort unique and

worthwhile. There is something else, too, just as important in the long run. Reading over the program last night, I was struck again—look at who your cooperators are. First, the Renewable Natural Resources Foundation, the grouping of professional and scientific societies. Second, the forest products industry, the Forest Industries Council; and third, our own organization, the National Resources Council of America.

So this is the unique thing you have done. You have brought all of us together—commodity user, preservationist, industry and scientist—all under one roof, cooperating for the common good, cooperating and supporting you in your efforts to provide us all with that vital hard base of information that finally will give us decisions that will stick, finally will resolve a lot of the controversy, so we can all get on with the job.



THE RENEWABLE NATURAL RESOURCES FOUNDATION

Mr. Hardin R. Glascock, Jr., Chairman, Board of Directors, Renewable Natural Resources Foundation; and Executive Vice-President and Editor-in-Chief, Society of American Foresters

On behalf of the Renewable Natural Resources Foundation, I wish to highly commend the statesmanlike presentation of major policy initiatives by Secretary Cutler. We in the Foundation consider this meeting and your statements to be a high point in a program that has been underway for over a year to examine forest and rangeland research policy and to try to understand what our responsibilities will be in the next 50 years.

The first 50 years have seen absolutely outstanding development in forest-related re-

search. It is thought of worldwide as a model. We lifted ourselves up by our bootstraps back in 1926 when the Society of American Foresters issued *A National Program of Forest Research*, and enactment of the McSweeney-McNary Act ensued. Now it is most appropriate we not only celebrate this anniversary, but also try to find out how we can improve on the 50 years of progress just completed. A great start has been made. It is going to be up to every one of us to take Dr. Cutler at his word and assist him in answering the questions he

has posed. Not all of the questions have been answered by any means.

I have been asked to tell you who the Renewable Natural Resources Foundation is, since it has been referred to a number of times and is relatively new. The Foundation, incorporated in 1972, is a consortium of national professional societies in the natural resource field, including: The American Fisheries Society, the Society of American Foresters, the Ecological Society of America, the American Geophysical Union, the Wildlife Society, the National Wildlife Federation, the American Association for Conservation Information, the Society for Range Management, the Association of Interpretive Naturalists, the American Water Resources Association, and the Institute of Ecology.

Foundation purposes are: To identify and fill knowledge gaps in renewable natural resources; to expedite the dissemination and application of research findings in the management and use of natural resources; to provide a comprehensive source of scientific information on the physical, biological, social sciences, economics, and the law pertaining to renewable natural resources; to facilitate coordination and cooperation among organizations having leadership responsibilities for renewable natural resources; and to establish a center for the member societies which will provide an appropriate working environment and permit the most efficient operation of each society.

We like what we hear of the proposed research policy and program for the 1980's. We would like to hear more. Some points we feel should be added. This Conference has listed over 400 problems in seven subject areas. We certainly do agree with Dr. Cutler that we have many researchable problems, and some of high priority. But to us, the highest priority problem of all is that of putting it all together. How do we coordinate and integrate the results of many, many studies to produce a usable and useful resources management system? Obviously, the research must be put together so it can be applied to our national and regional problems. Engineers put their building blocks together and end up with an elaborate and integrated structure. So must researchers put their results together to solve major problems and build thereon.

The Renewable Natural Resources Foundation, being a multiresource organization, features an integrated approach. We feel that unless research planning takes all of these

resources into account—water, timber, wildlife, fish, forage, esthetics—the research job is not done. Putting together research from several disciplines and subject areas should have your highest priority. It should be stated as a policy of the Department of Agriculture if public land management is to make use of research in achieving a high order of management. We compliment Dr. Cutler on his fourth policy initiative in which he emphasizes the quality and balance of forest research programs and the need to greatly strengthen research concerning wildlife, recreation, and noncommodity uses. We would add and stress the need to strengthen the interrelationship of these uses with commodity uses.

In addition, we commend to the Secretary for further consideration in developing the national research program, additional suggestions made at this Conference by Emery Castle, Keith Arnold, Tom Kimball, John Stephens, and Henry Vaux. Their papers contain several imaginative ideas that should be given close scrutiny. Some of them should become a part of your future program and policies in the Department of Agriculture and in the universities. You will recall these include: strengthening forestry in the context of international problems (I know this is one of your initiatives, Dr. Cutler, but feel it has been delineated in far more detail and should be reviewed), emphasis on creating stability in forestry through economic factors, and strengthening research organization through centers of excellence which has been mentioned many times at this Conference.

We also would like to call your attention to some of the recommendations that Dr. Spurr made this morning largely emanating from the Airlie House Symposium, which the Foundation conducted last year under grants from the sponsors of this Conference. Because they came from a strongly interdisciplinary interchange of ideas, these recommendations perhaps do the best job of describing the needs and some of the how-to-do-its for integrating our research policies.

The Renewable Natural Resources Foundation believes this Conference has been a success and important new starting point. We are grateful to have had the opportunity to serve as a cooperator in planning the program. Neither the scientific community nor the professional community can go it alone. We believe you have set a fine example here in recognizing the coordination now taking place among the resource professions.



THE FOREST INDUSTRIES COUNCIL

Mr. James W. McSweeney, Chairman, Forest Industries Council; and Chairman of the Board and Chief Executive Office, Mead Corporation. An employee of Mead since 1934. He serves as director of numerous organizations and professional groups. Leader of various community activities

As Chairman of the Forest Industries Council, I am pleased to respond to your Conference findings and to Dr. Cutler's paper on behalf of the forest industry, which the constituent associations of FIC represent; and, let me say, I'm impressed with the Conference and the integrity and sincerity of the participants.

The deliberations conducted here and in the preceding regional meetings reinforce one of my beliefs and concerns for our Nation—the vital need for increased emphasis on sharply focused research and development activity. In the truest sense, such efforts are essential investments in the future. Research and development is critical to the quality of life, the position of our country as a world leader, and to the health of our economy and its competitive ability.

There is no greater research opportunity than finding ways to use our renewable forest resource, and use it more effectively, to meet a multitude of needs and wants of all our people. You, and those whom you represent, acting upon the programs you have come here to prioritize, will make it happen—or not happen.

The repeated emphasis in the Conference program on *renewability* of the forest resource is excellent. It captures the dynamics of this unique natural wealth—and its unmet opportunities which challenge us. It is usable. It is reusable. It is adaptable to many purposes. It is ever-changing, with or without man's intervention.

Man can abuse it, but I share the assessment

of Professor Rene Dubos that, on balance, man's intervention has been beneficial both to man and to the environment and that nature possesses a remarkable resilience and ability to recover from both natural and man-made ravages. Man has learned how to accelerate this renewal process and to develop new ecosystems which are ecologically sound, economically productive, and esthetically rewarding.

Turning specifically to research planning, we would urge that research programs be evaluated and prioritized against an agreed set of objectives. That is—what are we trying to accomplish with forests and rangelands, and for whom? One need only make a cursory review of the Federal budget to be reminded that the interests and concerns we represent here today are only a small piece of the needs of society. Therefore, we cannot afford research for its own sake—nor because it is simply “interesting.” This is not to imply that research should be narrowly focused. Dr. Cutler emphasized the need for research in esthetic and noncommodity values. I would agree. Indeed, whatever our individual viewpoints, the American public has clearly stated that its quality-of-life expectations include esthetic, environmental, and recreational values as well as, but not in place of, economic values. The key is to coordinate economic values with all other values so that maximum, compatible multiple use of the forest may be achieved. And a necessary part of coordina-

tion is placing *measurable* values on these different considerations so that a real sense of priorities may be established.

The point can be further illustrated by the new dimension that energy problems have added to a lot of our thinking. We are increasingly hearing more about the potential use of forest resources as a fuel source. Forests are also being reevaluated as potential sources of chemical feed stocks to offset some of the present uses of oil. If either use becomes significant, it would place an increased demand on this renewable resource. We know that technically both uses are possible. But I doubt very much that we presently have sufficient knowledge about the economics, or social and environmental implications, of such developments to make sound policy decisions. These areas suggest new avenues for research in forestry; but they must be coordinated with all the others and directed at identified objectives which will best meet human needs.

I believe the foregoing is at least a partial response to one of Dr. Cutler's questions—"How much forestry research is needed?"

I would like to mention briefly a research project addressing the matter of increased forest productivity which the Forest Industries Council has had underway for a couple of years. According to the Forest Service and others, we are only growing trees on average at about 50 percent of potential on the 500 million acres of public and private forests in the Nation.

I'm not suggesting that every one of the 500 million acres of commercial forest has potential for increased productivity or additional uses. In fact, one of the very basic informational needs is better, up-to-date data on that land base. There are unique areas which *should* be reserved for wilderness. There are other lands simply not worth the time and money to develop beyond their present use—considering the many pressing economic and social needs of our society. And, as pointed out in a recent editorial in *American Forests*, there are so-called commercial forest lands—for example, very small tracts of a few acres, suburban land, and tracts where owners have completely different interests than growing trees—which aren't realistically available for full multiple-use forestry. Thus, we may be talking about only 60 or 75 percent of the 500 million acres as our working base. And these lands are divided into three very different types of ownership—public, industrial, and private nonindustrial owners—with very different objectives, restraints, and motivations.

The forest industry has a responsibility to do its part to identify the opportunities and trade-offs in the renewable forest and which it will take to realize those opportunities. The forest productivity study I refer to is being done in 24 major timber-growing States with the results just beginning to emerge and the entire project slated for completion by June 1979. Obviously, implementing programs to achieve the study recommendations will extend over many years, but we must get on with it because there's scarcely time to grow any type of tree to maturity between now and the year 2000.

Addressing another of Dr. Cutler's questions—"Who should participate?" Certainly every interest which is genuinely concerned with the future of this renewable natural resource, and which is knowledgeable and committed to doing something about it, should have the opportunity to participate in an appropriate way. This is a broad response. Let me talk about the constituency I represent. National Forest Products Association, American Paper Institute, and other forest industry associations have continuing relationships with the Forest Service, the Forest Products Lab, and any number of other public and private institutions concerned with forestry research. But I question whether this relationship has been as sharply focused, as coordinated, and as intensive and ongoing as it should be. This Conference has helped to sharpen our awareness of this need. I will be making recommendations to the Forest Industries Council in early February that this area must receive increased attention in the future—on a continuing basis.

Early in my remarks I stated that research must be sharply focused—that we need, in fact, to agree upon objectives for our national forest resource against which our research can be measured, our priorities established, and our limited resources of manpower and finances allocated.

We have also agreed, with remarkable accord I am pleased to note, that our forest strategy must encompass the attainment of multiple objectives: goals of product use, environmental compatibility, recreational services, watershed management, and wildlife and fishery development as examples. The specific goals for individual forest tracts will naturally differ, as will the relative importance of the various uses on each, to reflect geographical and ownership differences. But a national program for research, and national priorities, must be measured against a national objective—a national forest policy.

We have little evidence that such a policy exists. If so, certainly it has not been clearly articulated. It would be possible to infer that the policy is to keep productivity slightly in excess of domestic requirements, but I fear that this may be more of the expression of a hope than a national goal to which we are committed, and to which we are planning and allocating responsibilities and resources.

But is this our only option? Several speakers have referred to the potential for a significant net export of forest products. Indeed forestry and agriculture are our two greatest opportunities for increasing our national exports and helping balance our national trading accounts.

A range of alternatives is possible—if we agree that our forests should be managed to produce a significant level of exports. The rate at which we can develop a significant export trade, and the level we should strive to reach, are appropriate items for discussion—and then for establishment of national policy. We could wait until we fully understand the full potential for forest improvement, including a detailed knowledge of the program, costs, and timetable to accomplish it. But that is not really a satisfactory answer.

President Kennedy did not ask “can we reach the moon,” or “do we know how quickly we can do it?” He said we will do it, and do it by 1970, and then challenged our nation to find the how, and the when, and the means.

We know today the approximate potential for forest management improvement. Let us use this knowledge to set a national policy today for increasing the Nation's forest productivity so that we may achieve a realistic level of export surplus and do so in a manner that will also meet the other demands we are making on our forest resource. Once this is done, separate objectives for the public, industrial, and private forests will follow. Separate strategies will be needed for each. The national forests offer an opportunity to demonstrate what we already know about improved management and also an ideal laboratory in which to develop answers to the important issues you have discussed in this Conference. Industrial forests will develop their own strategy, compatible with many of the views expressed at this Conference, but also recognizing some of the owners' more limited objectives. The balance must come from the privately owned forests. Economic motivation is

the obvious way to improve management of this important segment of the forest resource. The strategy to do this may well require taxation changes and financial inducements. How much will depend on the goals we set.

And we need not wait until we have all the answers before we start. Trees take a long time to grow. We can adjust our strategy as we learn from our research, but the key is to set policies to goals now and get started.

So, in very brief summary—

1. We have regional forest systems, with both geographical and political differences.
2. We have a different ratio of ownership types in each region—public, industry, private.
3. These forest regions offer a host of multi-uses—but they are not necessarily the same for each region.
4. The policy or objective must be to improve the productivity of all of the various multi-uses. Otherwise, we have little need for additional research.
5. We must set objectives or policies and a time frame for productivity, use, environmental, and social needs.
6. We should exploit our ability to build and sustain a significant forest product export trade in addition to meeting our own domestic needs.
7. And finally, each constituency—public, industry, private—must make a contribution to the total declared objective and policy, and it must be clear to all what their contribution should be. The public and industry sectors are in a position to do their job. Together we must find ways to motivate the private sector to do its part.

If we'll recognize these points, setting the priorities on research and funding may not be as difficult as we think.

Dr. Cutler, I extend to the government the resources and willingness of the Forest Industry Council to help in arriving at such a national policy. I know that our member companies will commit their efforts to carry their part of it out. We all have a wonderful opportunity to contribute to our Nation's well-being. Let us not allow it to slip between our fingers.



Section VIII

SUMMARY OF CONFERENCE



Mr. William E. Towell, Executive Vice-President, American Forestry Association; Former Director, Missouri Department of Conservation; and prior to that, various positions in Missouri Department of Conservation

The most unusual aspect of this Conference is the Conference itself—its being, its gestation and birth, its fulfillment, and its conclusion. To my knowledge, it is a first—a unique effort of planning, on a large scale and involving so many different interests in identifying research needs and priorities. Never have I witnessed more thorough organization and project execution. As an early advisor to the National Steering Committee, I never dreamed that this effort to seek outside input into a national program for forests and associated rangelands research would reach such

proportions. I commend the Committee and all those who put this effort together. If your personal research problems or needs failed to surface at one of the regional conferences or this National Conference, it is your own fault because you have had the opportunity.

Where have you ever seen such a panel of experts review and make recommendations on research priorities? Have you ever known researchers to involve user and consumer groups so fully in their research planning? Have you ever seen such an immediate response to your recommendations as we have

had from Assistant Secretary Rupert Cutler at this Conference? I am sorry he is not here. I marvel at the ten "I will" or "will be done's" that I picked out of Rupe Cutler's speech—direct responses to the Conference we have had here for 3 days.

Yes, this truly is a first in forest and rangeland research, a milestone that will be referred to for years to come. No longer can critics say that forest and rangeland research operates in a vacuum or that researchers themselves determine their own work projects. I have always been a strong advocate of mission-oriented research. How could we better determine practical needs and priorities?

But, what has emerged here that is new or different? If we have merely reaffirmed the old projects or redefined the same research needs, what have we gained? Fortunately, this has not been the case. I see emerging from these conferences strong new emphasis in new research fields. It has been my privilege to serve as a working delegate at one regional workshop, to keynote another, and now to monitor and summarize this National Conference. What is new? What are the priorities? How will forests and rangelands research be redirected?

One key need that surfaced repeatedly is how to improve the delivery system of research findings themselves. How can the facts of research better serve the user? That's an important research problem in itself. Frankly, researchers have never been very good communicators except with each other. Let's get the results of research out of the technical journals and into the hands of resources administrators.

Another key priority identified frequently is the concern for environmental factors, for esthetics, recreation, fish and wildlife, and other amenity values of the forest. We already know how to manage most forest types for maximum timber production. Do we know how to optimize these other values? Perhaps our performance is not due as much to lack of knowledge as to failure to apply that knowledge. But the concern is genuine and it has been expressed here. The public is demanding and will get more management emphasis on the noncommodity products and uses of their forests.

Still another key problem identified at this and the regional conferences is the importance of small forest holdings and how to get better care and management on private nonindustrial lands. The success or failure of meeting future forest needs, whatever the management objectives, will be how well we manage

this 59 percent of our total forest acreage. Past efforts have not been too successful. How do we get the job done? That, too, is research.

Time won't permit me to highlight all of the key points that have been made here, but these are some of the things that I have heard.

The importance of international concerns and our obligations for international management of forest and rangeland resources. We are no longer a country unto ourselves.

I have heard much talk about the interrelationships of the public and private forest and range resources. We have been preoccupied too much with public lands, and the two must relate to each other.

I have heard expressed here the need for a clearer national policy for forests and rangelands. In the opinion of the American Forestry Association, this is one of the greatest failures in our forest management efforts—to enunciate clear national policy. What we are going to do with our forest lands?

I have heard expressed genuine concern about government reorganization, and this is important, too. It affects research.

Perhaps we have focused too strongly, too much on forest production, when we should have been thinking a little more about urban needs, fish and wildlife, and recreation.

More information, better information, quicker retrieval of information are essential to better forest and rangelands management. Inventory, appraisal, computer storage and retrieval also comprise research needs. These all came to the top in your sifting of research priorities.

Wood as an energy source came in for its share of priority interest, as it should, but you have already heard all that.

What are the implications of this Conference and where do we go from here? You have made your input. What will come of it? The future is always more important than the past, so let's take a look at what this Conference and its regional counterparts will mean in terms of future forests and rangelands research.

First, your recommendations will go back to the scientists and research administrators to be considered and, where practical, incorporated in preparation of regional and national programs. Some problems do not lend themselves to research, and we may have given the scientists more than they can handle. But, you can be sure they will be taking close looks at your priorities.

Second, we hope that you, as well as other users and consumers of forests and rangelands resources, will support the implementa-

tion of these programs. Research takes backing—moral and political as well as financial. Unless you get behind these research needs, little will be done. You have identified the problems—now get the research underway. It does little good to identify and prioritize without implementation

The third and final job, as well as the answer to where we go from here, is a continuing one. We hope you will regard your relationship to this effort only as a beginning. There will be a need for continuous updating, both on a day-by-day basis and more formally at not less

than 5-year intervals.

So, with one-third of the job now done, let's get on with the other two-thirds. As an outsider myself, I cannot speak for the research community. But I think I can speak for the resources managers and policymakers. Give us the tools, and we will get the job done. Tell us how to do it better, and we will change. Without application, research is meaningless. We have established a better dialog between the researcher and the user. Let's make the most of it.



Appendix

PROGRAM AGENDA

January 17, 1978, Tuesday
Ramada Inn, Rosslyn, Virginia

7:00-Noon Registration

Plenary Session I

Presiding: John Gray, General Conference Chairman

8:00	Welcome and Announcements—Donald Duncan, Co-Chairman, Steering Committee
8:15	Keynote Address—Richard Aldrich, Administrator, Cooperative State Research Service (CSRS)
8:45	Highlights of Regional Conferences—John Ohman, Coordinator, Regional Conferences
9:00	Orientation and Procedures—Richard Skok, Coordinator, Regional Conferences
9:15	Break

Work Group Sessions

9:45	Work Groups Convene—Problem Identification
11:30	Problem Ratings
12:00	Lunch
1:15	Work Groups Convene—Problem Identification
2:45	Problem Ratings
3:15	Break
3:30	Work Groups Convene—Problem Identification
5:00	Problem Ratings
5:30	Adjourn

January 18, 1978, Wednesday
Ramada Inn, Rosslyn, Virginia

Plenary Session II

- 8:30 Major Thrusts or New Initiatives in Forest Resources Research
Presiding: Robert E. Buckman, Co-Chairman, Steering Committee
1. McIntire-Stennis Advisory Committee's View of Forest Resources Research—Casey Westell, Jr., Director of Industrial Ecology, Tenneco, Inc.
 2. National Academy of Science Commission on Renewable Resources as Industrial Materials—James Bethel, Dean, College of Forest Resources, University of Washington
 3. Needed Major Initiatives in Forest Resources Research as Seen by Society of American Foresters—R. Keith Arnold, Society of American Foresters
 4. Needed Major Initiatives in Forest Resources Research as Seen by Resources for the Future—Emery Castle, Vice-President, Resources for the Future
- 10:15 Break
- 10:45 Presiding: John D. Sullivan, Steering Committee Member
5. Needed Forest Resources Research as Seen by the Forest Industry—John Stephens, Vice-President, International Paper Company
 6. Needed Forest Resources Research as Seen by Conservation Groups—Tom Kimball, Executive Vice-President, National Wildlife Federation
 7. Needed Forest Resources Research as Seen by Public Policymakers—Henry Vaux, Chairman, California State Board of Forestry

Plenary Session III

- Presiding: George M. Browning, Steering Committee Member
- 1:30 Results of Problem Ratings Balloting—Irving Holland, Co-Chairman, Working Committee
- 1:45 Work Group Presentations
- 3:05 Break
- 3:30 Continue Work Group Presentations
- 4:30 Rate Subject Areas
- 5:00 Adjourn

January 18, 1978, Wednesday Evening

- 7:00 Social Hour
- 8:00 Dinner-Flag Hall
- Presiding: M. Rupert Cutler, Assistant Secretary for Conservation, Research, and Education, U.S. Department of Agriculture
- Welcome and Recognition of Distinguished Guests
- Speaker: "Where We Are in Natural Resources Reorganization"—Richard A. Pettigrew, Assistant to the President for Reorganization

January 19, 1978, Thursday
Baird Auditorium, Smithsonian
Museum of Natural History

- 7:30-8:30 Registration
- 8:30 Presiding: H.R. Glascock, Jr., Chairman, Board of Directors, Renewable Natural Resources Foundation
Welcoming Remarks—Representative of Office of Secretary of Agriculture: Dr. Robert Gluckstern, President, NASULGC
- 9:00 The Smithsonian and Renewable Natural Resources Science—David Challinor, Assistant Secretary for Science, Smithsonian Institution
- 9:20 The Role of the Department of Agriculture, NASULGC, and ASCUFRO in Renewable Natural Resources Research—Orville Bentle, Co-Chairman, ARPAC
- 9:35 Brief Overview of Entire Planning Effort and Summarize Results of First Two Days—Richard Skok, Coordinator, Regional Conferences
- 9:55 Break
- 10:15 Recommendations of the Renewable Natural Resources Foundation Forest and Rangelands Research Policy Symposium—Stephen Spurr, Chairman
- 11:45 Transport by Chartered Buses to L'Enfant Plaza Hotel
- 12:30 Luncheon—Ballroom
Presiding: John McGuire, Chief, Forest Service
Introduction of Distinguished Guests
Award to the Honorable John Stennis, U.S. Senator from Mississippi—Rodney Foil, Member, ASCUFRO
- 2:15 Chartered Buses to Smithsonian
- 3:00 Presiding: Brock Evans, President, Natural Resources Council of America
A Proposed Policy and Program for Research for Forests and Associated Rangelands for the 1980's—M. Rupert Cutler, Assistant Secretary for Conservation, Research, and Education, U.S. Department of Agriculture
- 3:00 Presiding: John Muench, Jr., Director of Economics, National Forest Products Association
Users and Cooperators Responses:
Brock Evans, President, Natural Resources Council of America
H.R. Glascock, Chairman, Board of Directors, Renewable Natural Resources Foundation
James W. McSwiney, Chairman, Forest Industries Council
- 4:00 Summary—William Towell, Executive Vice-President, American Forestry Association
- 4:10 Adjourn
- Note** ARPAC-Agricultural Research Policy Advisory Committee
ASCUFRO-Association of State College and University Forestry Research Organizations
NASCULGC-National Association of State Universities and Land-Grant Colleges

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- Selected Forest Industry Trade Associations

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